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## Trends in the DoD Industrial Base

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Monterey, California. Naval Postgraduate School

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NATIONAL DEFENSE RESEARCH INSTITUTE

# Trends in the DoD Industrial Base

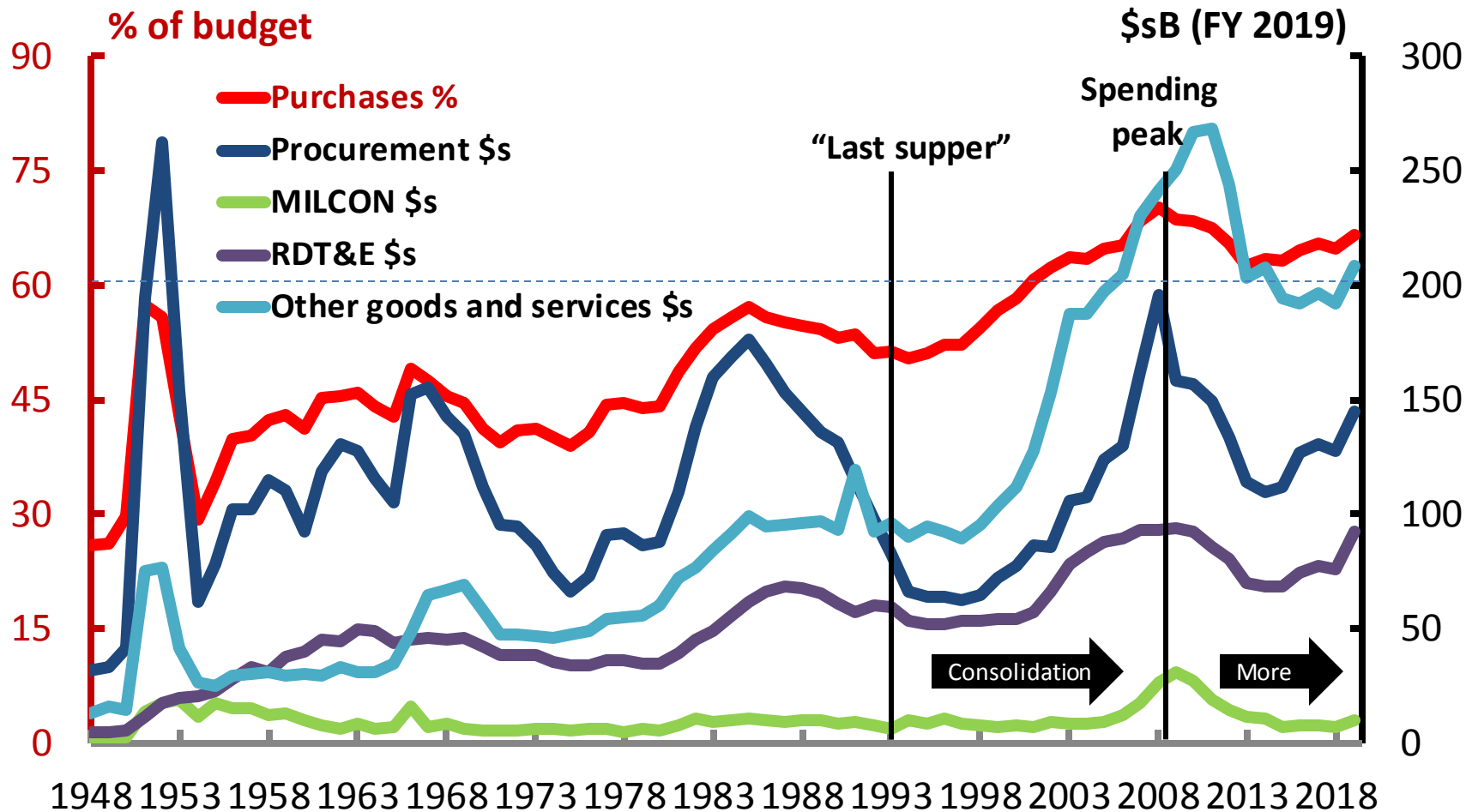
Nancy Young Moore, Clifford A. Grammich, and  
Judith D. Mele

15<sup>th</sup> Annual Acquisition Research Symposium  
May 9, 2018

# What Constitutes DoD's Industrial Base?

- Forward looking
  - Industries supported by Procurement dollars primarily for new weapons and modifications → Aerospace and Defense (A&D) industry
  - Industries supported by Research, Development, Test, and Evaluation (RDT&E) dollars focused on advanced technology acquisition → Technology industry + A&D
- Backward looking
  - Industries supported by Operations and Maintenance dollars for Sustainment → Aerospace and Defense industry

# DoD Purchases Have Been Increasing Relative to Personnel Costs while Procurement and RDT&E Funding Has Varied



Sources: OUSD(Comptroller), National Defense Budget Estimates for FY 2019, March 2018, Table 6-1, 6-2, [http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2019/FY19\\_Green\\_Book.pdf](http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2019/FY19_Green_Book.pdf).

# Global Industry Consolidation Continues

- Industries tend to consolidate over time - faster in recent years<sup>1</sup>
- Global Merger and Acquisition (M&A) activity in 2017 = \$3.59 trillion<sup>2</sup>
  - North America = \$1.82 trillion, > 50% of global
  - Aerospace and Defense M&A was relatively small ~ \$57.5 billion in 2015 (1.6%) and \$17.5 billion in 2016 (0.5%)<sup>3</sup>
  - Technology M&A was 10X or more higher ~ \$593 billion in 2015 (16.5%) and \$717 billion in 2016 (20.0%)<sup>4</sup>

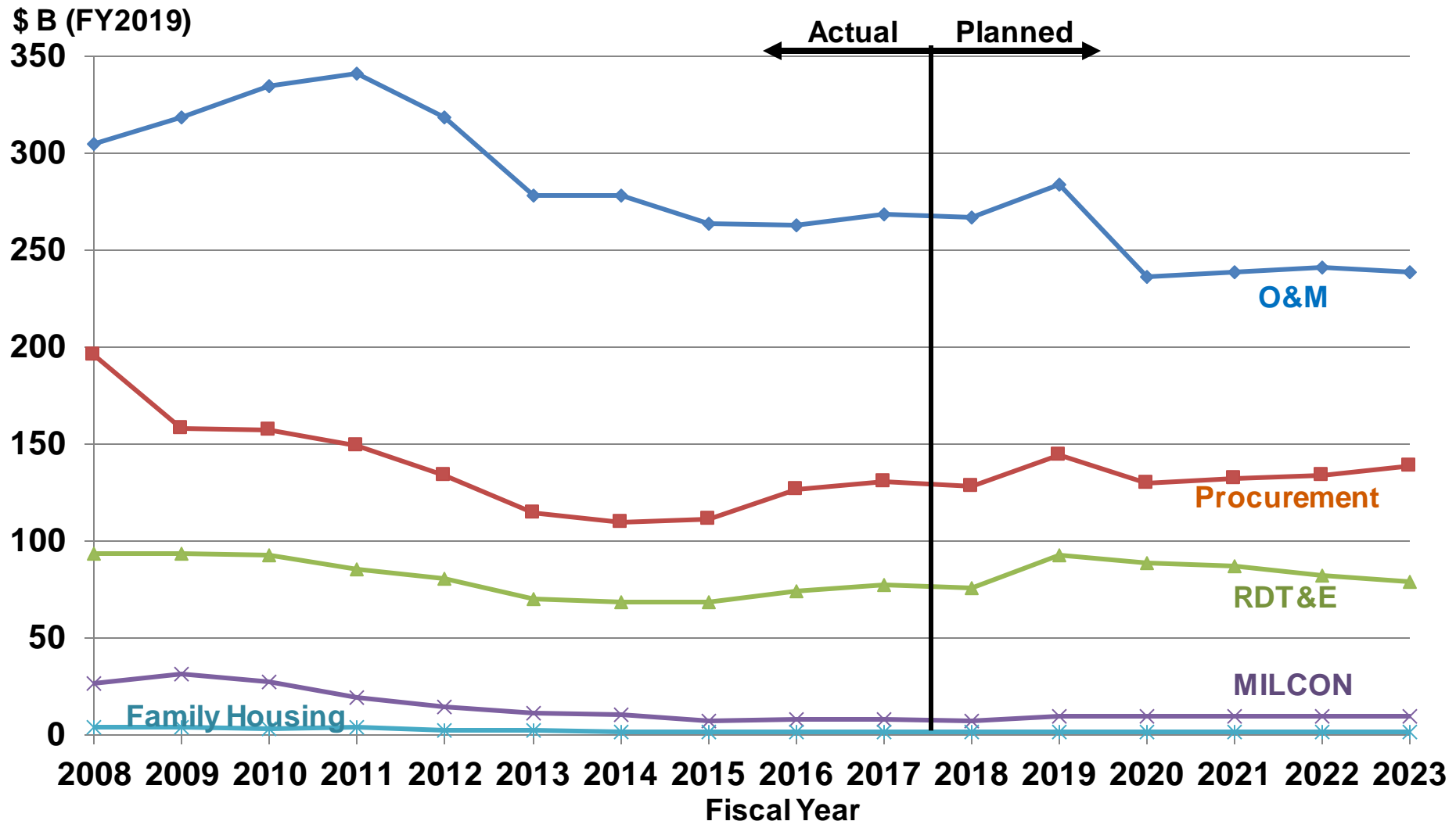
<sup>1</sup>Deans, Graeme K., Kroeger, Fritz, and Zeisel, Stefan, "The Consolidation Curve," *Harvard Business Review*, December 2002.

<sup>2</sup><https://imaa-institute.org/mergers-and-acquisitions-statistics/#Largest-Mergers-Acquisitions-North-America>

<sup>3</sup><https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/us-aerospace-and-defense-trends.pdf>

<sup>4</sup><https://www.bcg.com/en-us/publications/2017/corporate-development-finance-technology-digital-2017-m-and-a-report-resurgent-high-tech-marketplace.aspx>

# Procurement and RDT&E Are Projected to Both Increase and Decrease Slightly in Future Budgets



Source: OUSD(Comptroller), National Defense Budget Estimates for FY 2019, March 2018, Table 6-1  
[http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2019/FY19\\_Green\\_Book.pdf](http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2019/FY19_Green_Book.pdf)

NOTE: Data in Constant FY2019 Dollars.

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# Top DoD Industries Ranked by 2012 Procurement Dollars

| NAICS    |                                 | Procure \$sB* |      | Total DoD \$sB |      | Total Industry \$Bs |
|----------|---------------------------------|---------------|------|----------------|------|---------------------|
| Code     | Name                            | 2012          | 2016 | 2012           | 2016 | 2012                |
| 336411   | Aircraft Manufacturing          | 23.6          | 24.2 | 46.7           | 44.8 | 113.0               |
| 336611   | Ship Building and Repairing     | 11.8          | 10.4 | 16.6           | 15.0 | 24.9                |
| 336414   | Missile & Space Veh. Mfg.       | 6.1           | 5.6  | 10.7           | 10.4 | 19.7                |
| 541330   | Engineering Services            | 5.5           | 4.9  | 28.8           | 25.6 | 208.1               |
| 336413   | Other Aircraft Pts./Equip. Mfg. | 4.1           | 2.5  | 13.5           | 12.7 | 34.3                |
| 334511   | Search Instrument Mfg.          | 3.9           | 4.1  | 9.1            | 10.8 | 47.0                |
| 336992   | Armored Vehicle & Tank Mfg.     | 3.4           | 1.3  | 6.5            | 3.9  | 5.6                 |
| 541710-2 | R&D in Sciences                 | 3.0           | 1.3  | 25.4           | 22.4 | 110.7               |
| 332993   | Ammo. (not small-arms) Mfg.     | 2.2           | 3.0  | 2.8            | 3.7  | 3.6                 |
| 336412   | Acft. Engines & Engine Parts    | 2.1           | 2.4  | 5.3            | 6.2  | 37.1                |
| 334220   | Radio/TV Broadcast Equip.       | 2.1           | 1.1  | 4.9            | 2.5  | 30.3                |
| 332410   | Boiler and Heat Exch. Mfg.      | 1.2           | 1.4  | 1.2            | 1.4  | 7.1                 |

\* Treasury Account Symbols became optional on ICARS as of June 25, 2016

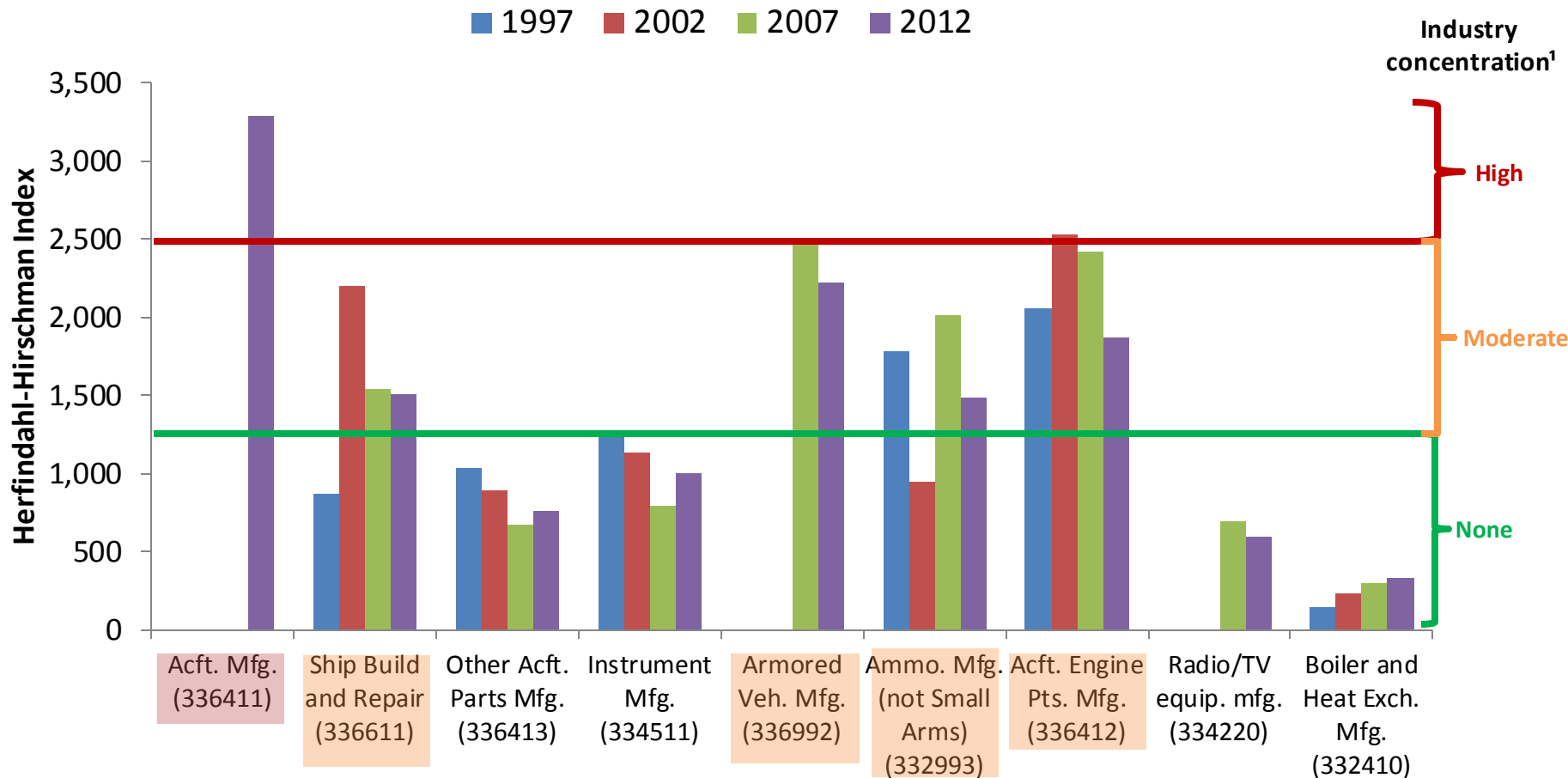
# DoD Is the Dominant Buyer in Some of Its Top Procurement Dollars Industries

| NAICS    |                                 | Procure Share of DoD \$s* |      | DoD Share of Industry \$s |
|----------|---------------------------------|---------------------------|------|---------------------------|
| Code     | Name                            | 2012                      | 2016 | 2012                      |
| 336411   | Aircraft Manufacturing          | 51                        | 54   | 41                        |
| 336611   | Ship Building and Repairing     | 71                        | 69   | 66                        |
| 336414   | Missile & Space Veh. Mfg.       | 58                        | 54   | 54                        |
| 541330   | Engineering Services            | 19                        | 19   | 14                        |
| 336413   | Other Aircraft Pts./Equip. Mfg. | 30                        | 20   | 39                        |
| 334511   | Search Instrument Mfg.          | 43                        | 38   | 19                        |
| 336992   | Armored Vehicle & Tank Mfg.     | 52                        | 35   | 117                       |
| 541710-2 | R&D in Sciences                 | 12                        | 6    | 23                        |
| 332993   | Ammo. (not small-arms) Mfg.     | 79                        | 80   | 79                        |
| 336412   | Acft. Engines & Engine Pts.     | 40                        | 40   | 14                        |
| 334220   | Radio/TV Broadcast Equip.       | 43                        | 44   | 16                        |
| 332410   | Boiler and Heat Exch. Mfg.      | 99                        | 99   | 18                        |

\* Treasury Account Symbols became optional on ICARS as of June 25, 2016



# Herfindahl-Hirschman Index of Market Concentration by Industry, 1997-2012



<sup>1</sup>As defined U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines, August 19, 2010, p. 19.

Source: Economic Census. Data not available for years not shown.

# Number of Industry Firms Varies by Data Source

- Economic Census (EC)/Statistics of U.S. Businesses (SUSB)
  - Firms report revenue and employees by their *predominate industry/NAICS*
  - If they provide goods and services in other industries it can *undercount* in those industries
- System for Award Management (SAM) - formerly Central Contractor Register (CCR)
  - Firms register in *all industries/NAICS* in which they seek business in the federal government
  - They may have never done work in some of the industries and thus, can be an *overcount* of firms in those industries

# Number of Firms in Top DoD Industries Ranked by 2012 Procurement Dollars

| NAICS  |                                 | Number of Firms in 2012 |        | CCR/SUSB |
|--------|---------------------------------|-------------------------|--------|----------|
| Code   | Name                            | SUSB                    | CCR    |          |
| 336411 | Aircraft Manufacturing          | 226                     | 2,030  | 8.98     |
| 336611 | Ship Building and Repairing     | 604                     | 1,807  | 2.99     |
| 336414 | Missile & Space Veh. Mfg.       | 16                      | 832    | 52.00    |
| 541330 | Engineering Services            | 45,749                  | 39,832 | 0.87     |
| 336413 | Other Aircraft Pts./Equip. Mfg. | 745                     | 4,868  | 6.53     |
| 334511 | Search Instrument Mfg.          | 453                     | 3,740  | 8.26     |
| 336992 | Armored Vehicle & Tank Mfg.     | 60                      | 2,243  | 37.38    |
| 541712 | R&D in Sciences                 | 9,672                   | 18,974 | 1.96     |
| 332993 | Ammo. (not small-arms) Mfg.     | 45                      | 486    | 10.80    |
| 336412 | Acft. Engines & Engine Parts    | 355                     | 2,196  | 6.19     |
| 334220 | Radio/TV Broadcast Equip.       | 748                     | 4,395  | 5.88     |
| 332410 | Boiler and Heat Exch. Mfg.      | 266                     | 618    | 2.32     |

# As Much as 50 to 80 percent of a Product's Costs Can Be in The Supply Base

- Many large product manufacturers have become assemblers which increases the percentage of the product's costs that are in the supply base
- Tracking product suppliers and their costs could provide insights in drivers of cost increases
- Federal collection of subaward data began in 2010

# 2016 Weapon Systems Contracts with Subawards Ranked by Prime Dollars

| Weapon        | Prime |           |             | Subawards |           |             |             |
|---------------|-------|-----------|-------------|-----------|-----------|-------------|-------------|
|               | \$s M | Contracts | Contractors | \$s M     | Contracts | Contractors | % prime \$s |
| F-35          | 5,789 | 34        | 16          | 113       | 111       | 63          | 20          |
| Trident II    | 3,318 | 353       | 203         | 768       | 283       | 162         | 23          |
| PATRIOT       | 2,717 | 239       | 83          | 244       | 87        | 62          | 9           |
| F-15          | 2,482 | 135       | 68          | 5         | 5         | 6           | <1          |
| F/A-18 E/F    | 2,242 | 19        | 17          | 58        | 29        | 14          | 3           |
| CH-47F        | 1,858 | 33        | 18          | <1        | 3         | 3           | 0           |
| AMRAAM        | 1,822 | 17        | 4           | 102       | 444       | 123         | 5           |
| DDG 51        | 1,562 | 10        | 7           | 476       | 121       | 76          | 26          |
| AH-64E Rmfg.  | 1,342 | 24        | 15          | 1         | 1         | 1           | 0           |
| CVN 68        | 1,221 | 81        | 64          | 6         | 48        | 14          | <1          |
| Patriot/MEADS | 1,181 | 36        | 26          | 74        | 440       | 184         | 6           |
| SCOUT         | 1,174 | 10        | 7           | 4,809     | 14        | 13          | 407         |
| Tactical UAV  | 1,119 | 10        | 6           | 16        | 28        | 19          | 1           |

Sources: Federal Procurement Data System – Next Generation (FPDS-NG), Federal Funding Accountability and Transparency Act Subaward Reporting System (FSRS), 2017.

# Top 2016 Weapon System Contracts With No Reported Subaward Data

| Awarded \$ M | Weapon system | Agency    | # contracts | # NAICS | # Contractors |
|--------------|---------------|-----------|-------------|---------|---------------|
| 2,979        | KC-46A        | Air Force | 2           | 2       | 2             |
| 1,592        | DDG 51        | Navy      | 19          | 11      | 14            |
| 1,394        | F/A-22        | Air Force | 9           | 6       | 5             |
| 1,077        | LHA 6         | Navy      | 8           | 4       | 5             |
| 688          | DDG 1000      | Navy      | 14          | 10      | 10            |
| 513          | CVN 68        | Navy      | 9           | 5       | 6             |
| 291          | JLTV          | Army      | 6           | 6       | 6             |
| 242          | Javelin       | Army      | 6           | 2       | 2             |

Sources: Federal Procurement Data System – Next Generation (FPDS-NG), Federal Funding Accountability and Transparency Act Subaward Reporting System (FSRS), 2017.

# Weapon Systems with the Most Reported Subaward Dollars

| Weapon        | Prime |           |             | Subawards |           |             |             |
|---------------|-------|-----------|-------------|-----------|-----------|-------------|-------------|
|               | \$s M | Contracts | Contractors | \$s M     | Contracts | Contractors | % prime \$s |
| Patriot/MEADS | 1,181 | 36        | 26          | 4,809     | 14        | 13          | 407         |
| STRYKER (IAV) | 661   | 31        | 25          | 2,548     | 642       | 225         | 385         |
| E-2D AHE      | 322   | 26        | 19          | 1,359     | 500       | 198         | 422         |
| Trident II    | 3,318 | 353       | 203         | 768       | 283       | 162         | 23          |
| BRADLEY FVS   | 292   | 42        | 30          | 725       | 689       | 237         | 249         |
| AMRAAM        | 1,822 | 17        | 4           | 476       | 121       | 76          | 26          |
| POSEIDON      | 268   | 2         | 2           | 469       | 141       | 107         | 175         |
| P-8A          | 369   | 22        | 15          | 351       | 27        | 24          | 95          |
| PATRIOT       | 2,717 | 239       | 83          | 244       | 87        | 62          | 9           |
| Minuteman III | 243   | 5         | 4           | 161       | 12        | 8           | 66          |
| AIM-9X        | 251   | 4         | 2           | 147       | 42        | 30          | 59          |
| G/ATOR        | 21    | 4         | 2           | 135       | 2         | 2           | 631         |
| ABRAMS Upg    | 86    | 8         | 7           | 125       | 165       | 80          | 145         |
| TACTOM        | 275   | 4         | 2           | 118       | 57        | 49          | 423         |
| F-35          | 5,789 | 34        | 16          | 113       | 111       | 63          | 2           |

Sources: Federal Procurement Data System – Next Generation (FPDS-NG), Federal Funding Accountability and Transparency Act Subaward Reporting System (FSRS), 2017.

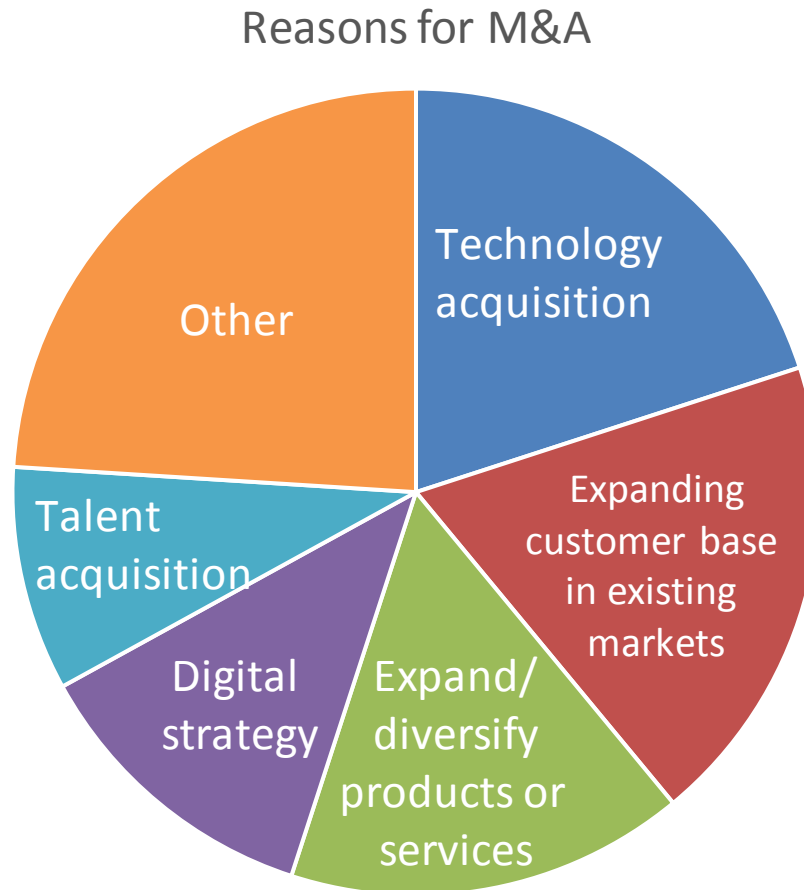
# Findings

- Industries continue to consolidate globally, while Defense and Aerospace is consolidating slower
- DoD is a dominant or major buyer in some, but not all, top procurement industries
- One top DoD industry by total Procurement dollars is already highly concentrated and several more are close to being so
- Data on weapon system subawards is still incomplete and questionable



# Questions?

# Mergers and Acquisitions Are Driven By Many Factors in 2018

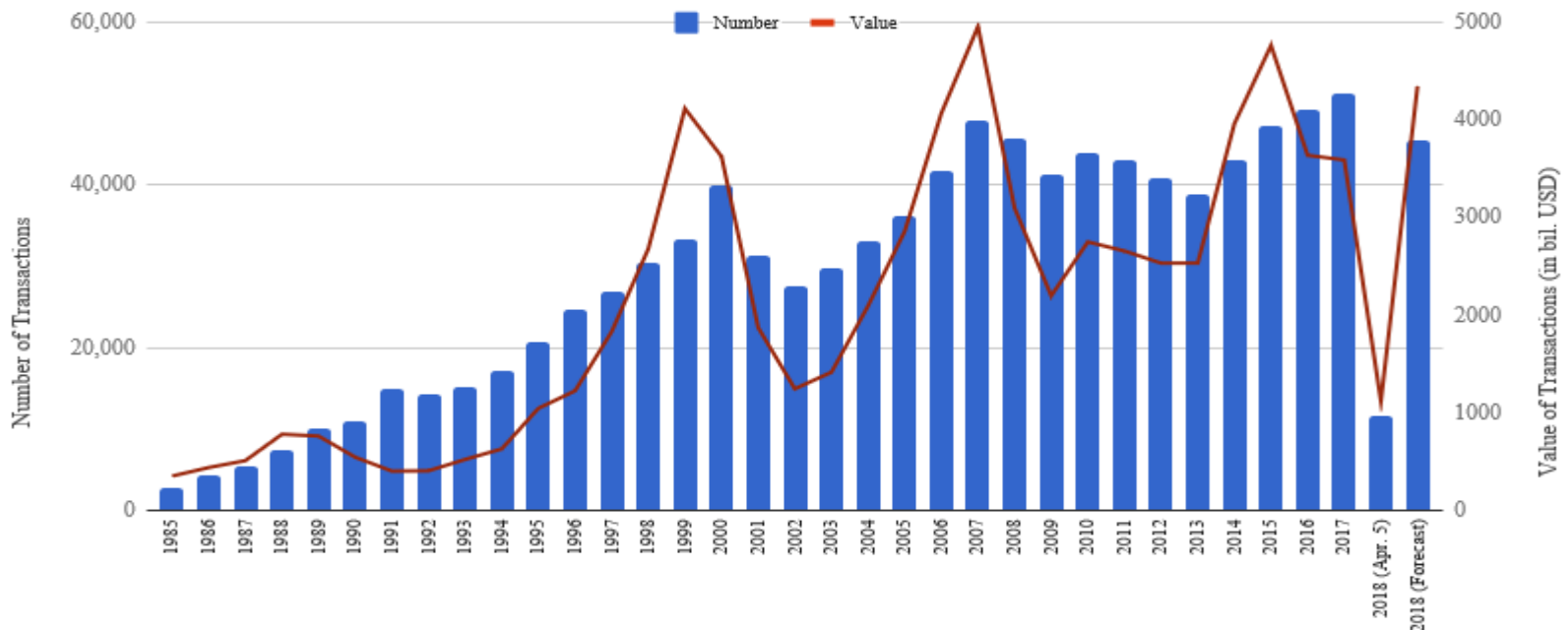


# Continuing Substantial Number and Value of Worldwide Mergers and Acquisitions

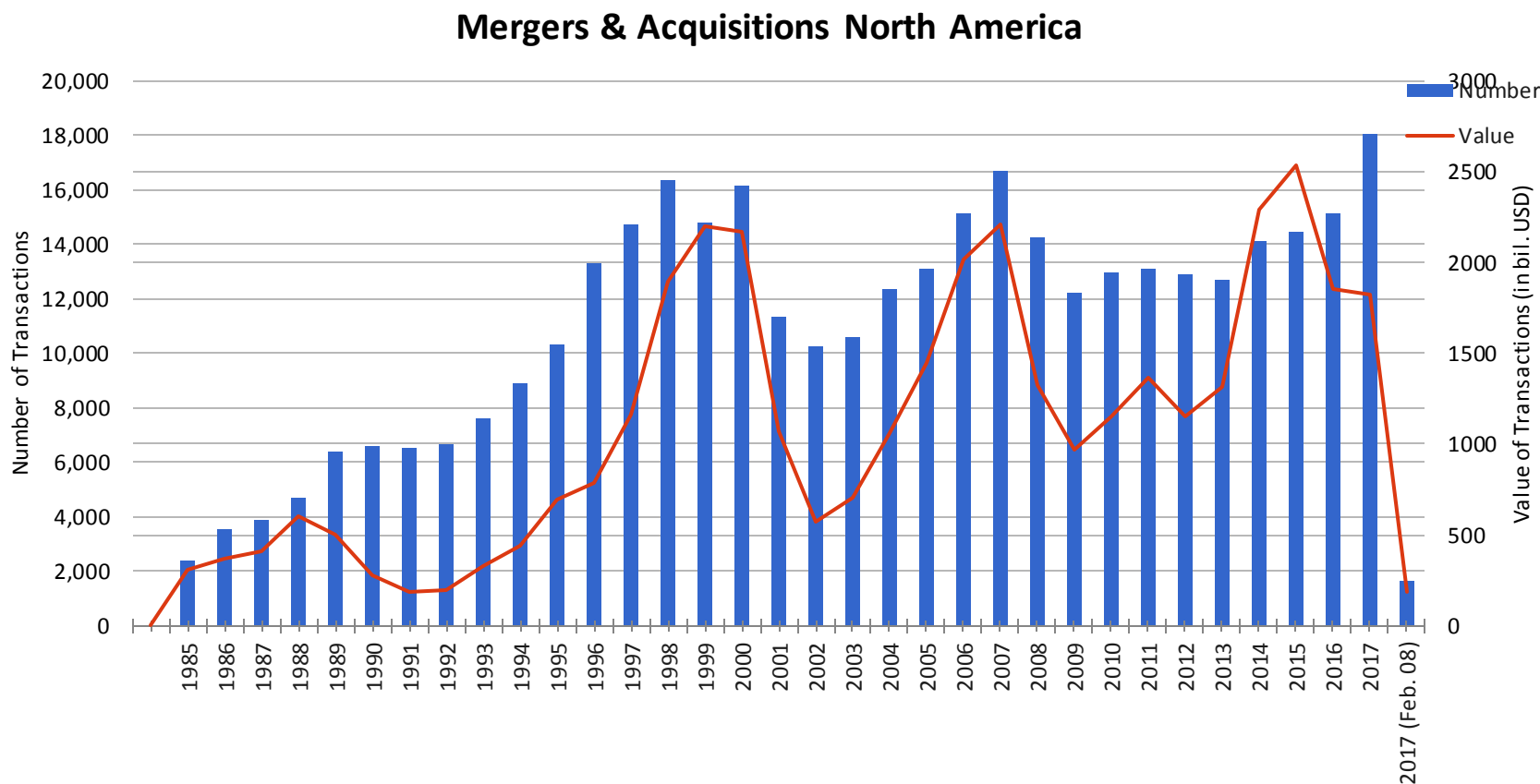
## Number & Value of M&A Worldwide

In 2017, companies announced over 50'600 transactions with a total value of more than 3.5 trillion USD (2.9 trillion EUR/ 2.5 trillion GBP). Compared to 2016, the numbers of deals grew only marginally by 2.9% while the value declined by 2.00%.

**Mergers & Acquisitions Worldwide**

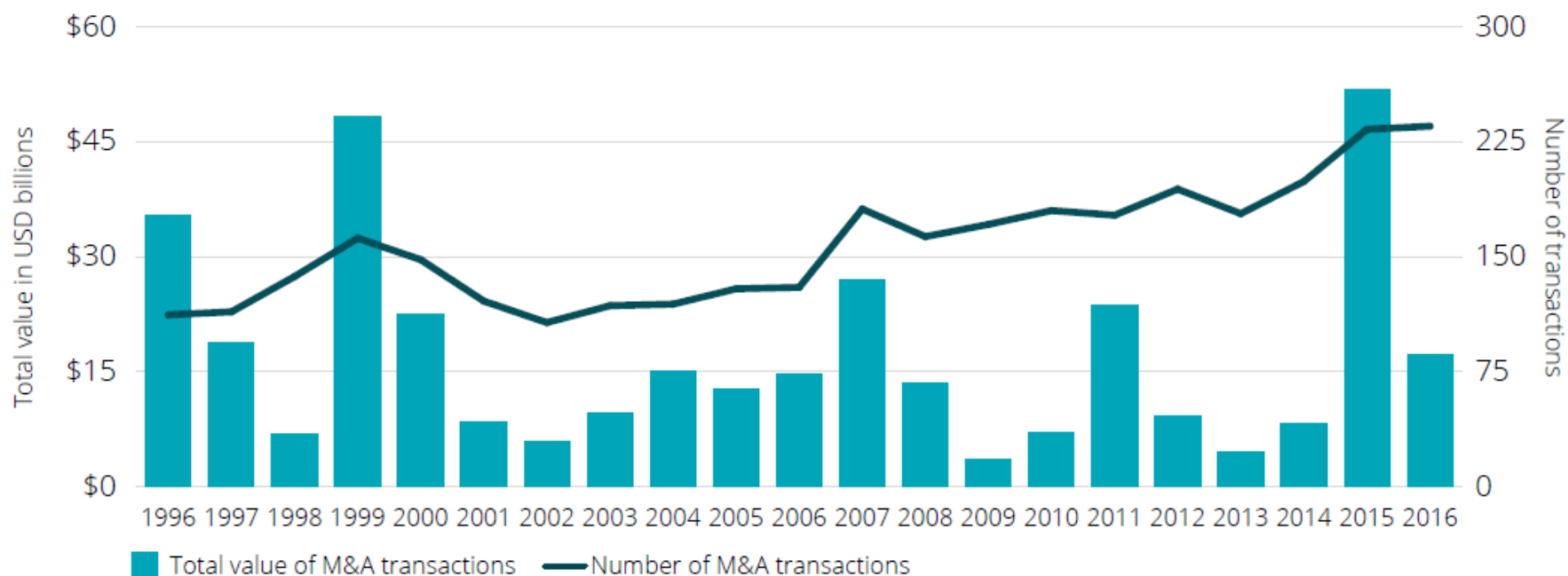


# Continuing Substantial Number and Value of Mergers and Acquisitions in North American



# Aerospace and Defense M&A Activity Is Less Than it Was, But Still Occurring

Figure 1. Annual aerospace and defense transactions and transaction value (1996-2016)



Source: SDC Platinum

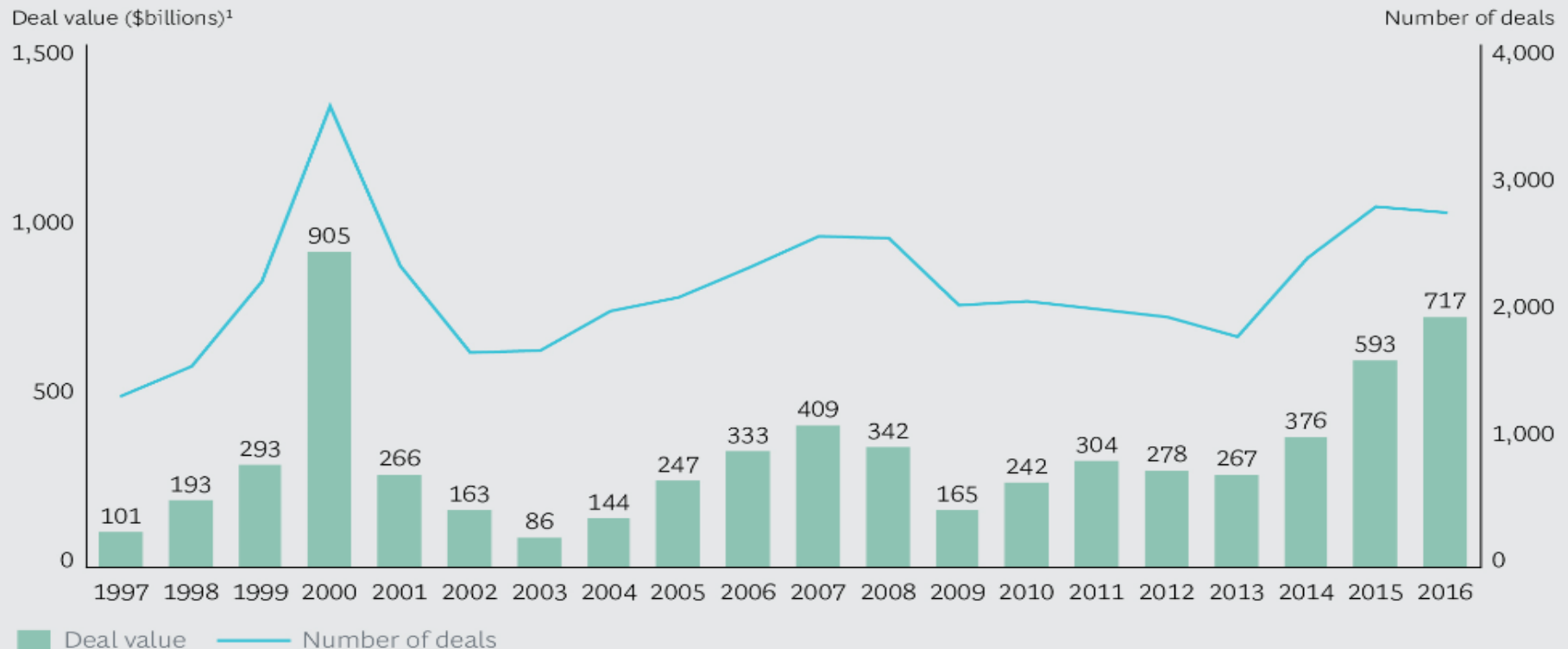
# Aerospace and Defense Enterprises Continue to Acquire Firms

| Enterprise          | Well known recent examples       |
|---------------------|----------------------------------|
| Lockheed Martin     | Savi, Sirkorsky                  |
| General Dynamics    | Gulfstream, GM Defense, CSRA?    |
| Textron             | Beechcraft, Arctic Circle        |
| Boeing              | Aurora Flight Sciences           |
| United Technologies | Rockwell Collins                 |
| Raytheon            | Websense, Blackbird Technologies |
| Northrop Grumman    | Orbital, ATK                     |

# Technology Industry M&A Is A Factor of Ten or More Greater than Aerospace and Defense

## EXHIBIT 1 | Tech M&A Value and Volume Approach the Heights of 2000

TECH M&A VALUE AND VOLUME SHOW A STRONG TRAJECTORY OVER TIME



**Sources:** Thomson ONE Banker; BCG analysis.

**Note:** The total of 43,101 tech M&A transactions with a disclosed deal value comprises completed and unconditional deals announced between 1997 and 2016, with no transaction-size threshold. Self-tenders, recapitalizations, and repurchases were excluded.

<sup>1</sup>Enterprise values include the net debt of targets.

# Technology Industry Leaders Have Been Making a LOT of Acquisitions

| Enterprise        | Estimate of Number acquisitions | Well known examples         |
|-------------------|---------------------------------|-----------------------------|
| Alphabet (Google) | 215                             | YouTube, Waze, Nest         |
| Amazon            | 85                              | Ring, Whole Foods           |
| Facebook          | 67                              | WhatsApp, Oculus, Instagram |
| Microsoft         | 208                             | Hotmail, LinkedIn           |
| Apple             | 94                              | Siri                        |
| Cisco             | 190                             | Linksys, Jasper, Jabber     |
| Twitter           | 54                              |                             |

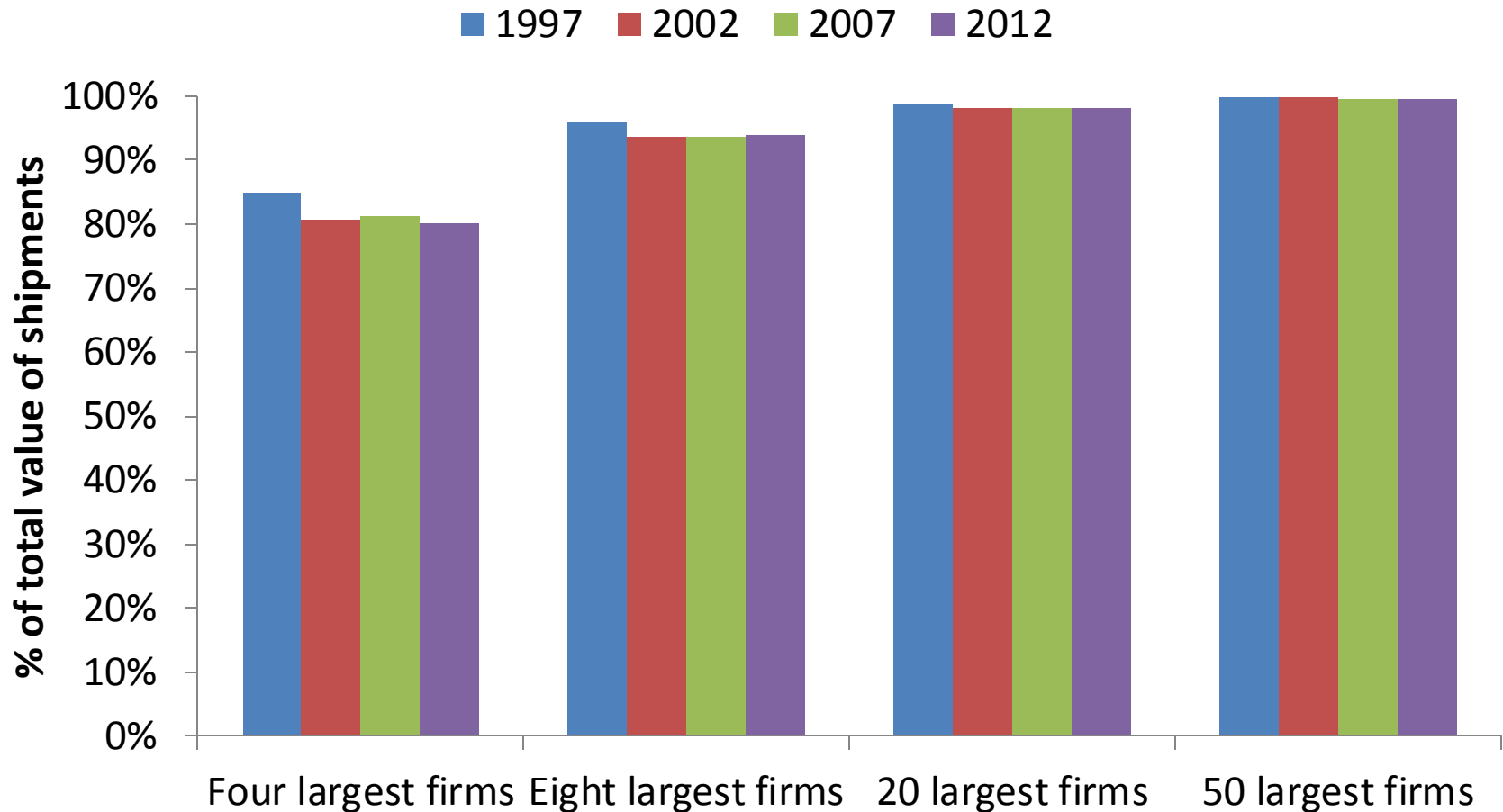
They also have stakes in other companies



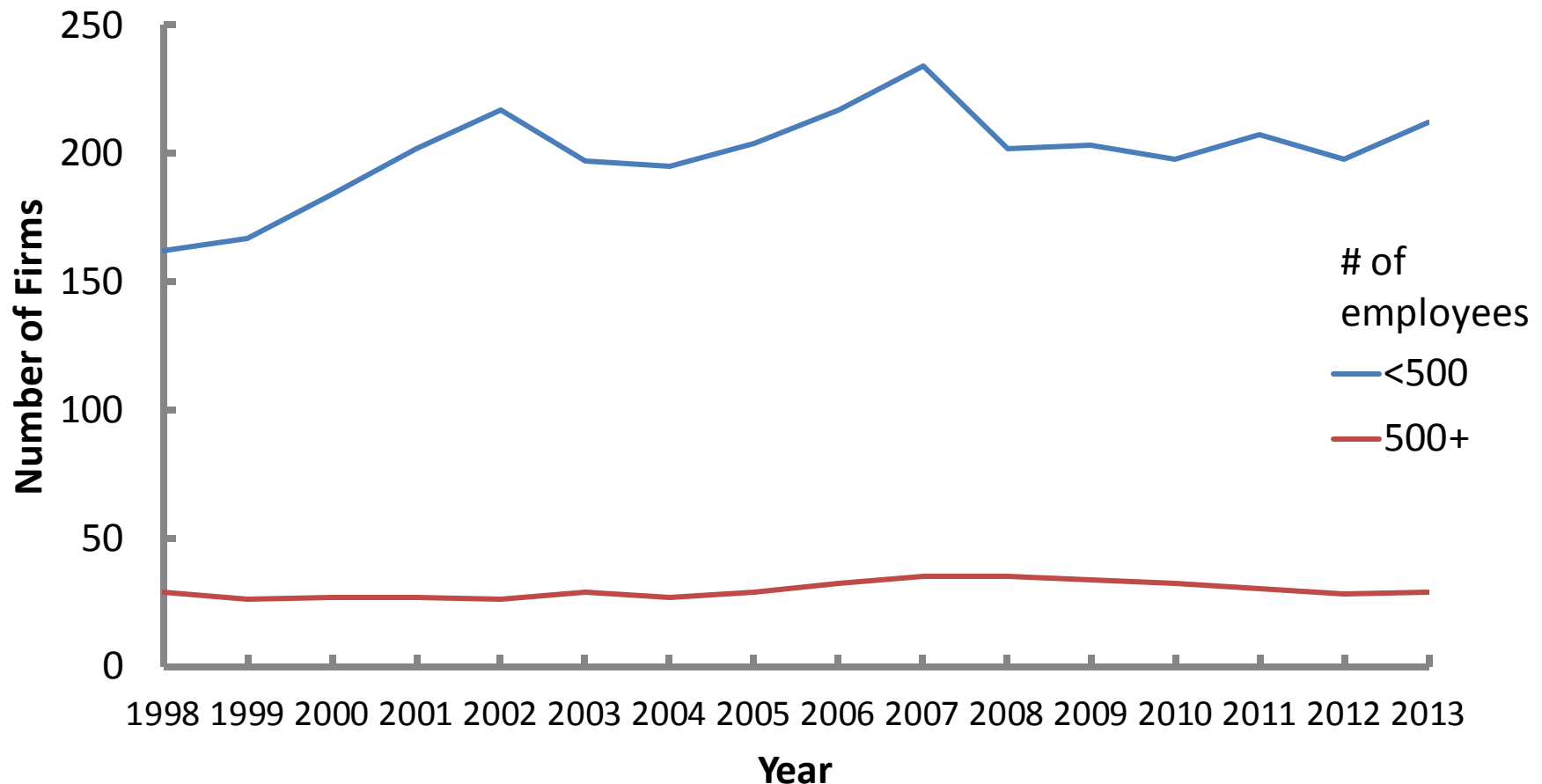
# NAICS Codes Are Often Very Broad — Aircraft Manufacturing Example

- Airplane(military, civilian, general aviation)
  - Manufacturing
  - Conversions
  - Overhauling
  - Rebuilding
  - Prototype development
- Other aircraft mfg.
  - Autogiro
  - Blimp
  - Drone
  - Glider
  - Helicopter
  - Ultralight

# Concentration Indexes for Aircraft Manufacturing (NAICS Code 336411)

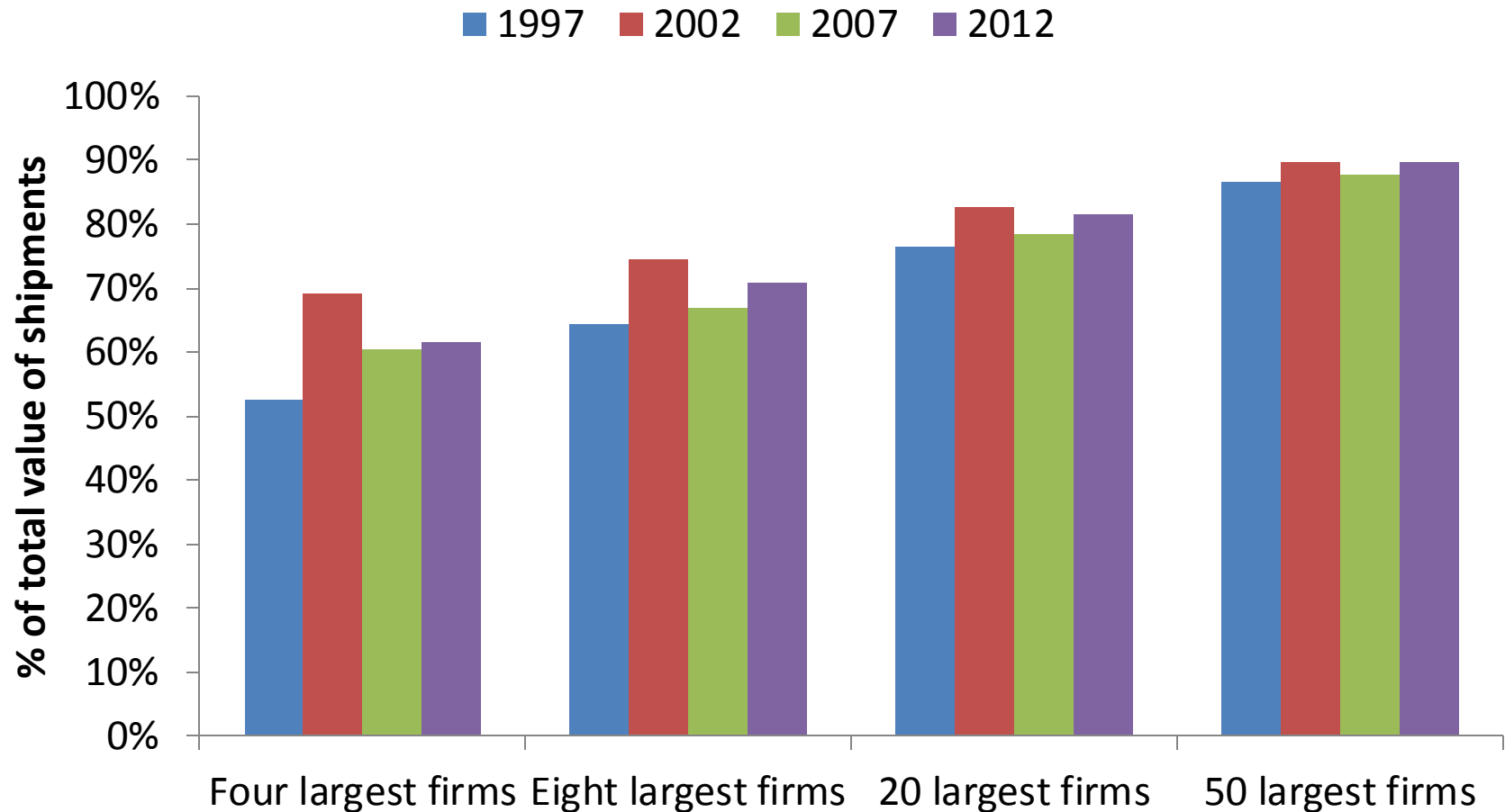


# Aircraft Manufacturing (NAICS Code 336411) Firms by Number of Employees

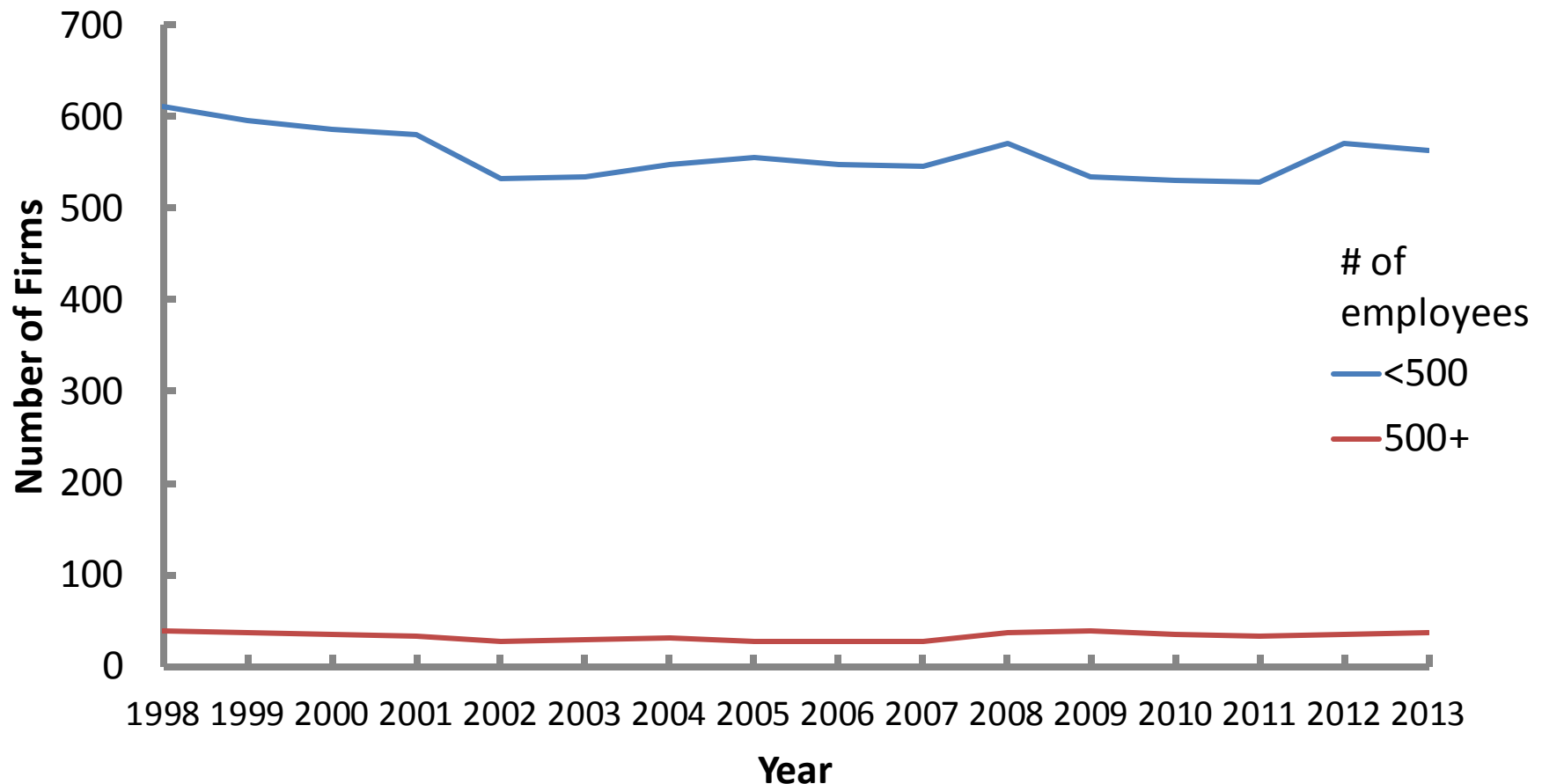


SBA size standard = 1,500 employees

# Concentration Indexes for Ship Building and Repairing (NAICS Code 336611)

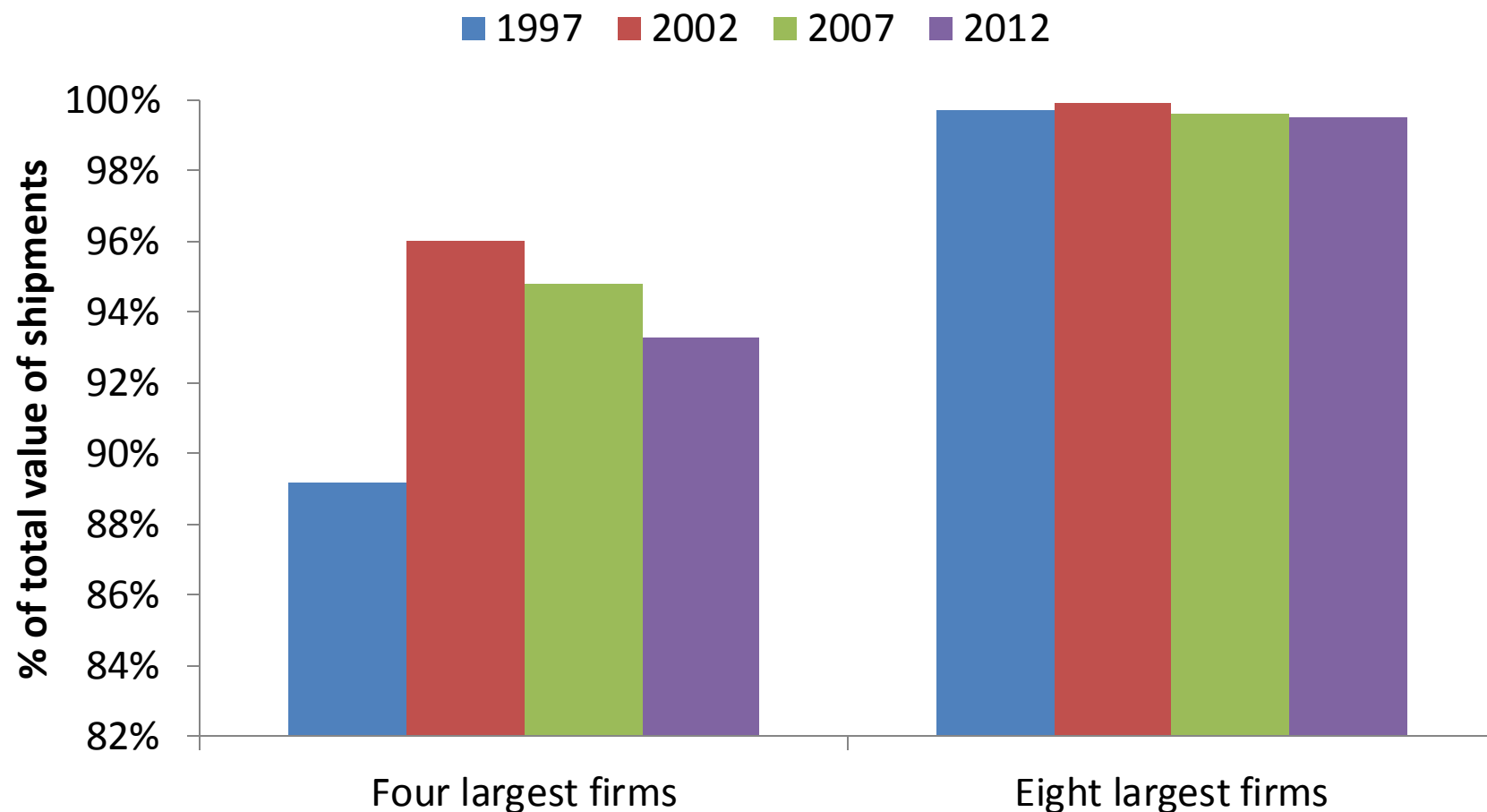


# Ship Building and Repairing (NAICS Code 336611) Firms by Number of Employees

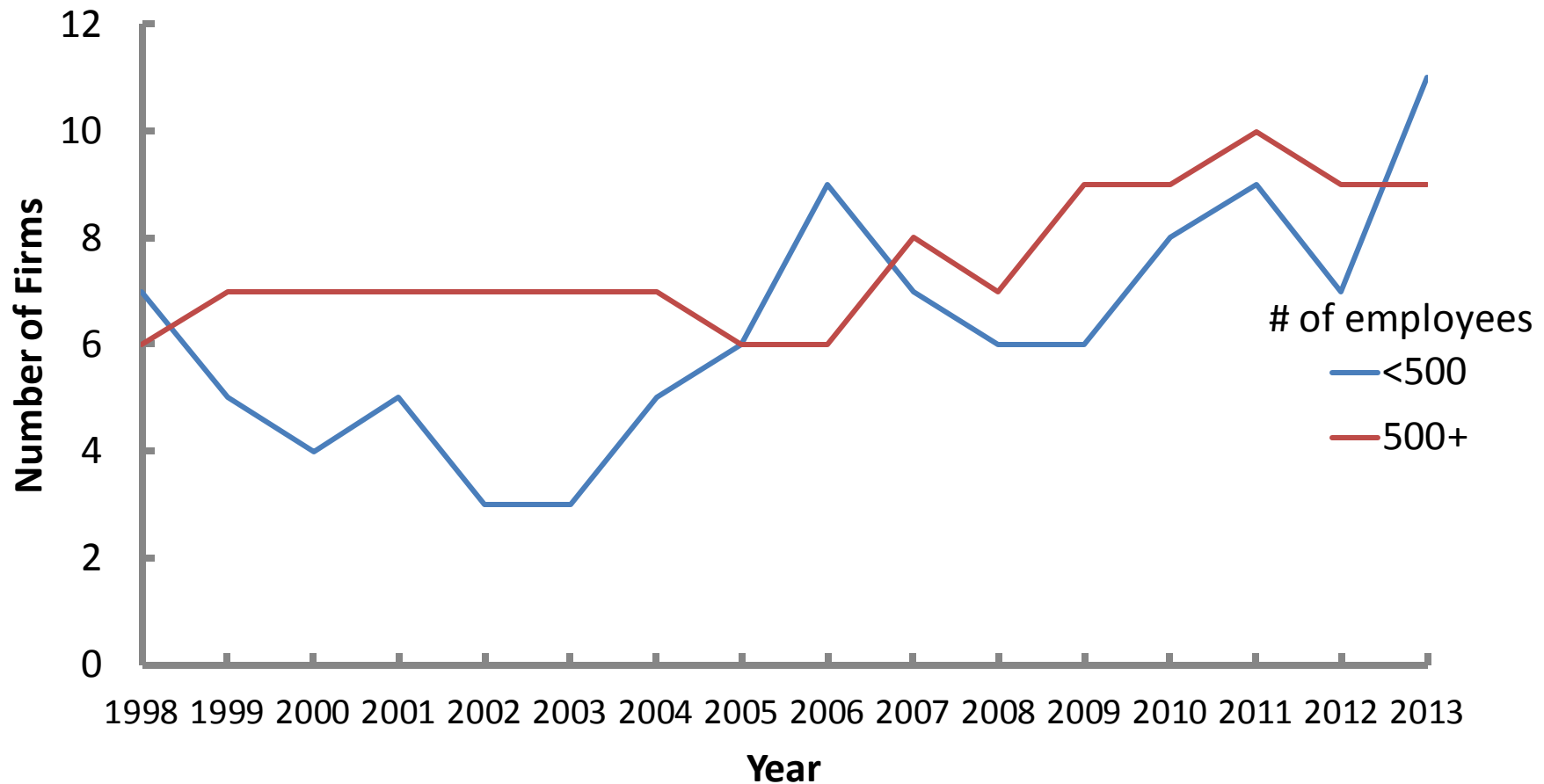


SBA size standard = 1,250 employees

# Concentration Indexes for Guided Missile and Space Vehicle Manufacturing (NAICS Code 336414)

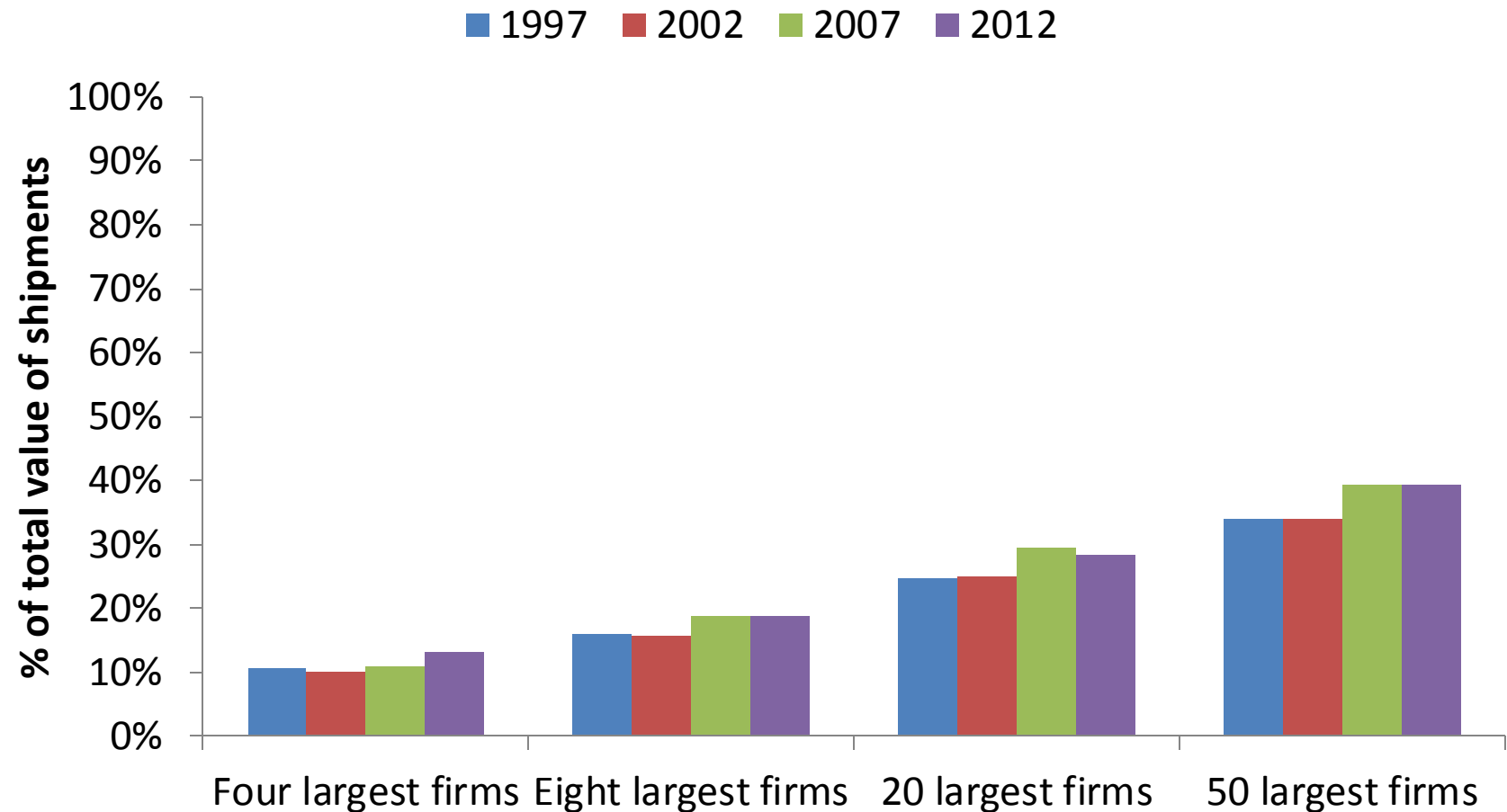


# Guided Missile and Space Vehicle Manufacturing (NAICS Code 336414) Firms by Number of Employees



SBA size standard = 1,250 employees

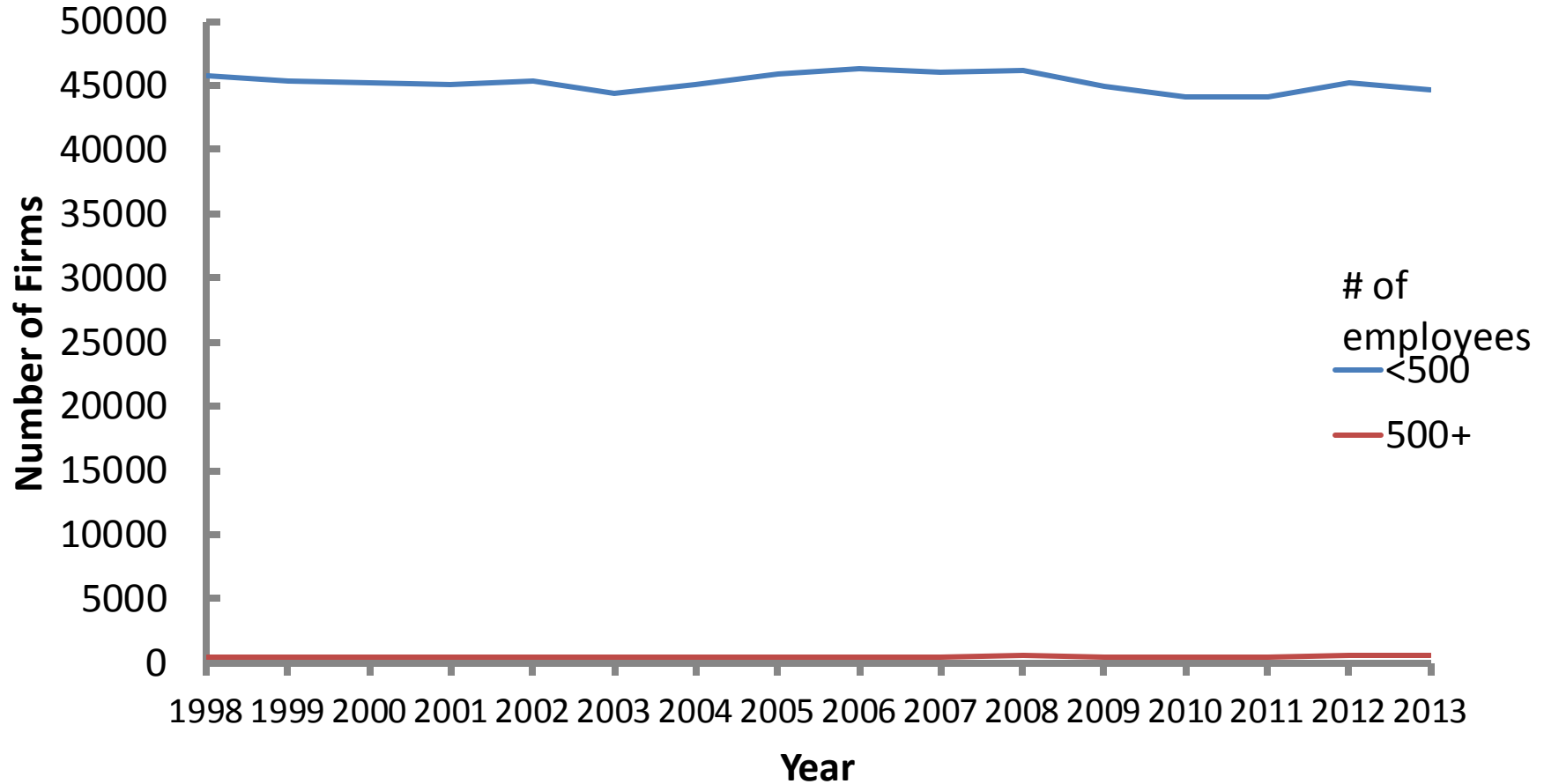
# Concentration Indexes for Engineering Services (NAICS Code 541330)





# Engineering Services (NAICS Code 541330)

## Firms by Number of Employees



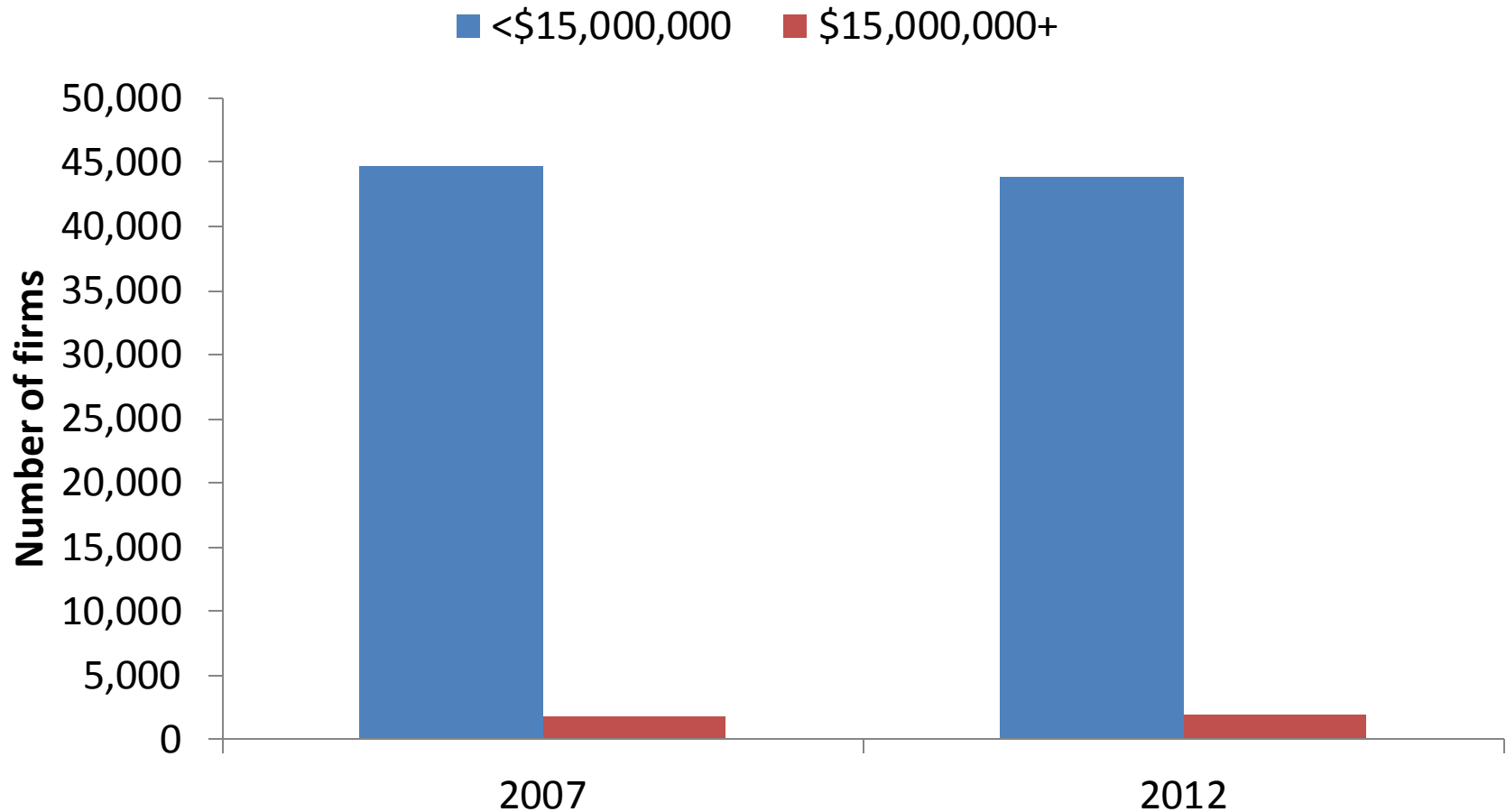
SBA size standard = \$15 million in revenue except Military and Aerospace Equipment and Military Weapons, Contracts and Subcontracts for Engineering Services Awarded Under the National Energy Policy Act of 1992, and Marine Engineering and Naval Architecture = \$38.5 million in revenue

Source: Statistics of U.S. Businesses

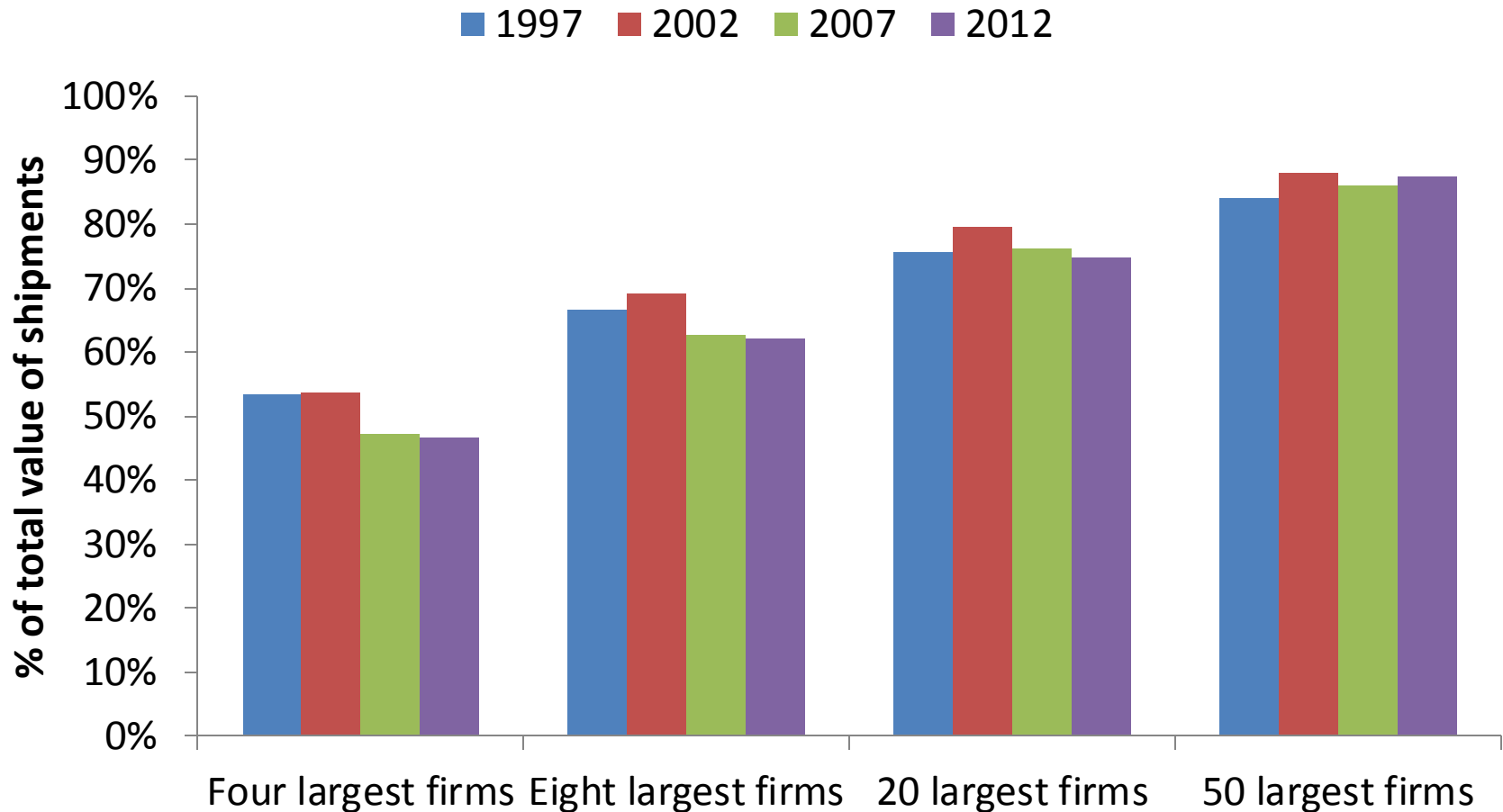
Approved for public release; distribution is unlimited.

# Engineering Services (NAICS Code 541330)

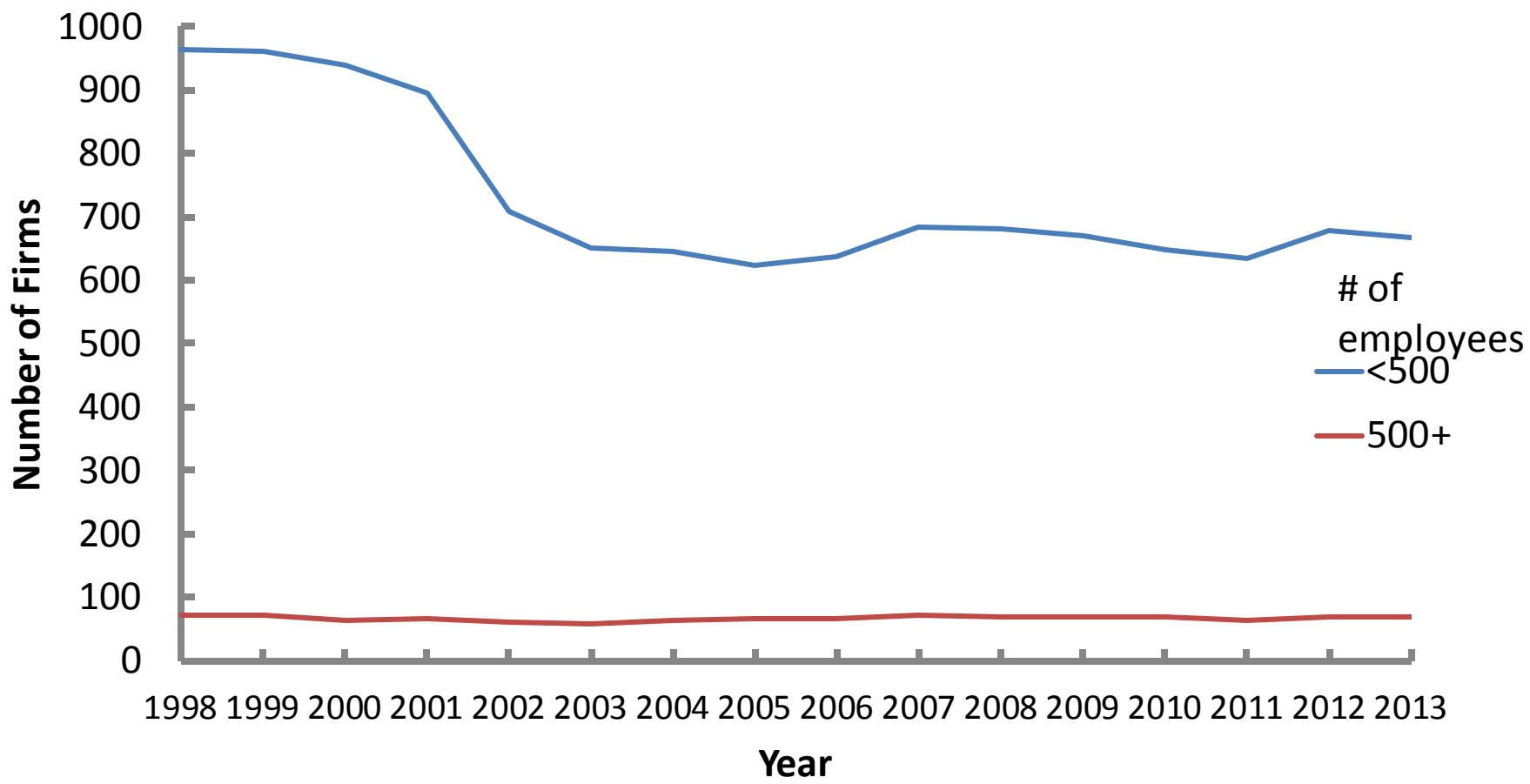
## Firms by Annual Receipts



# Concentration Indexes for Other Aircraft Parts and Auxiliary Equipment Manufacturing (NAICS Code 336413)

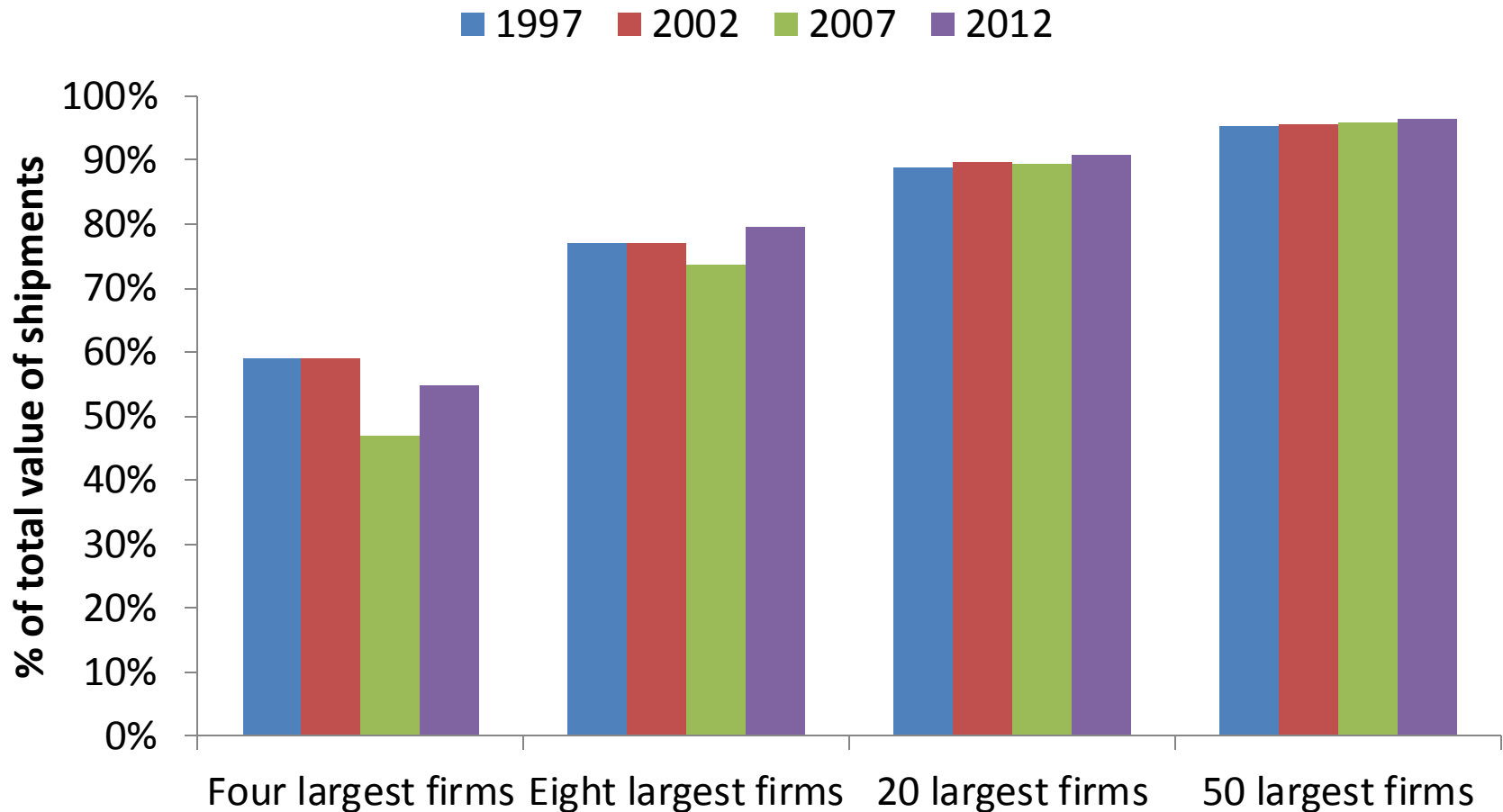


# Other Aircraft Parts and Auxiliary Equipment Manufacturing (NAICS Code 336413) Firms by Number of Employees

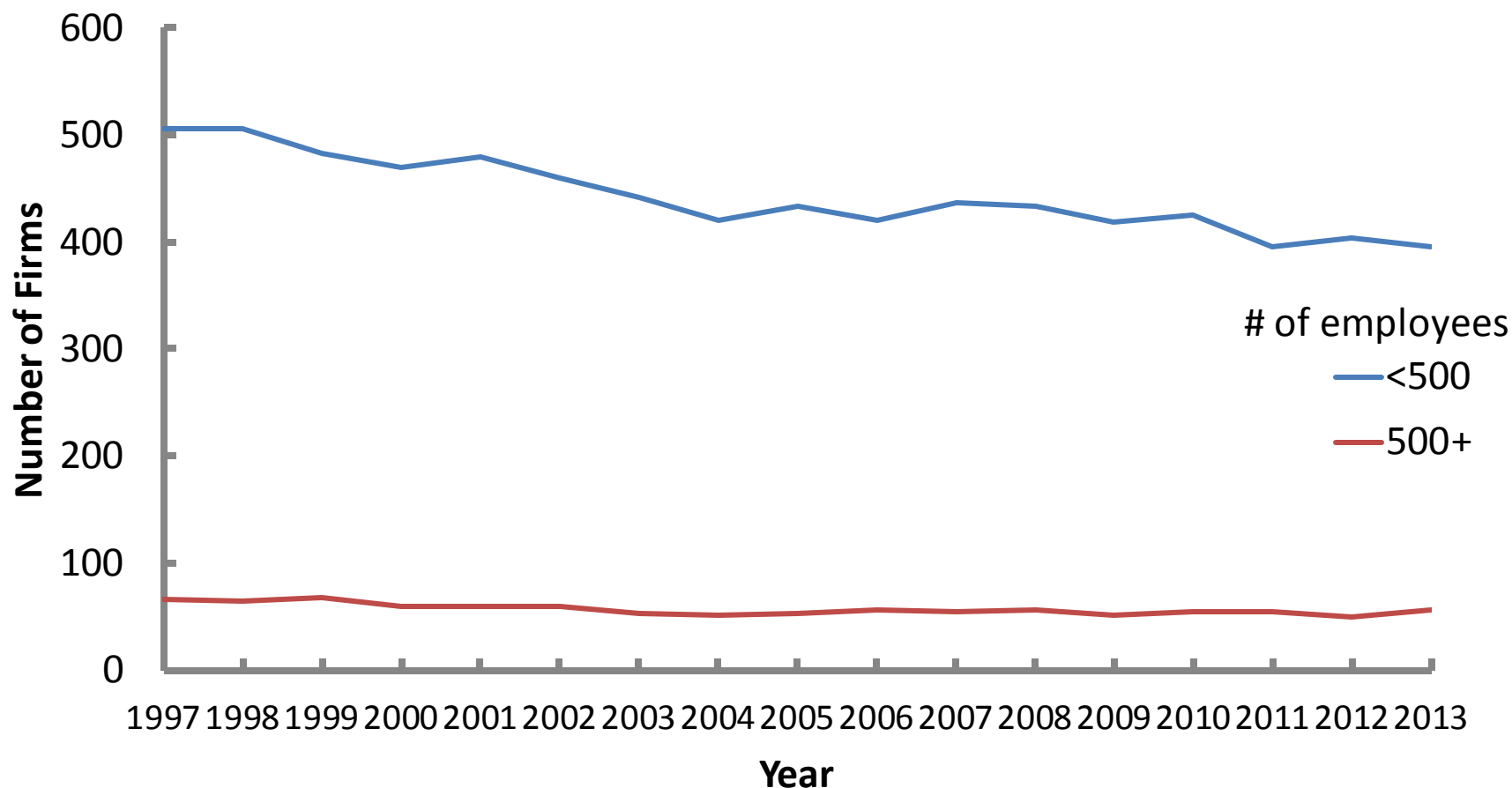


SBA size standard = 1,250 employees

# Concentration Indexes for Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing (NAICS Code 334511)

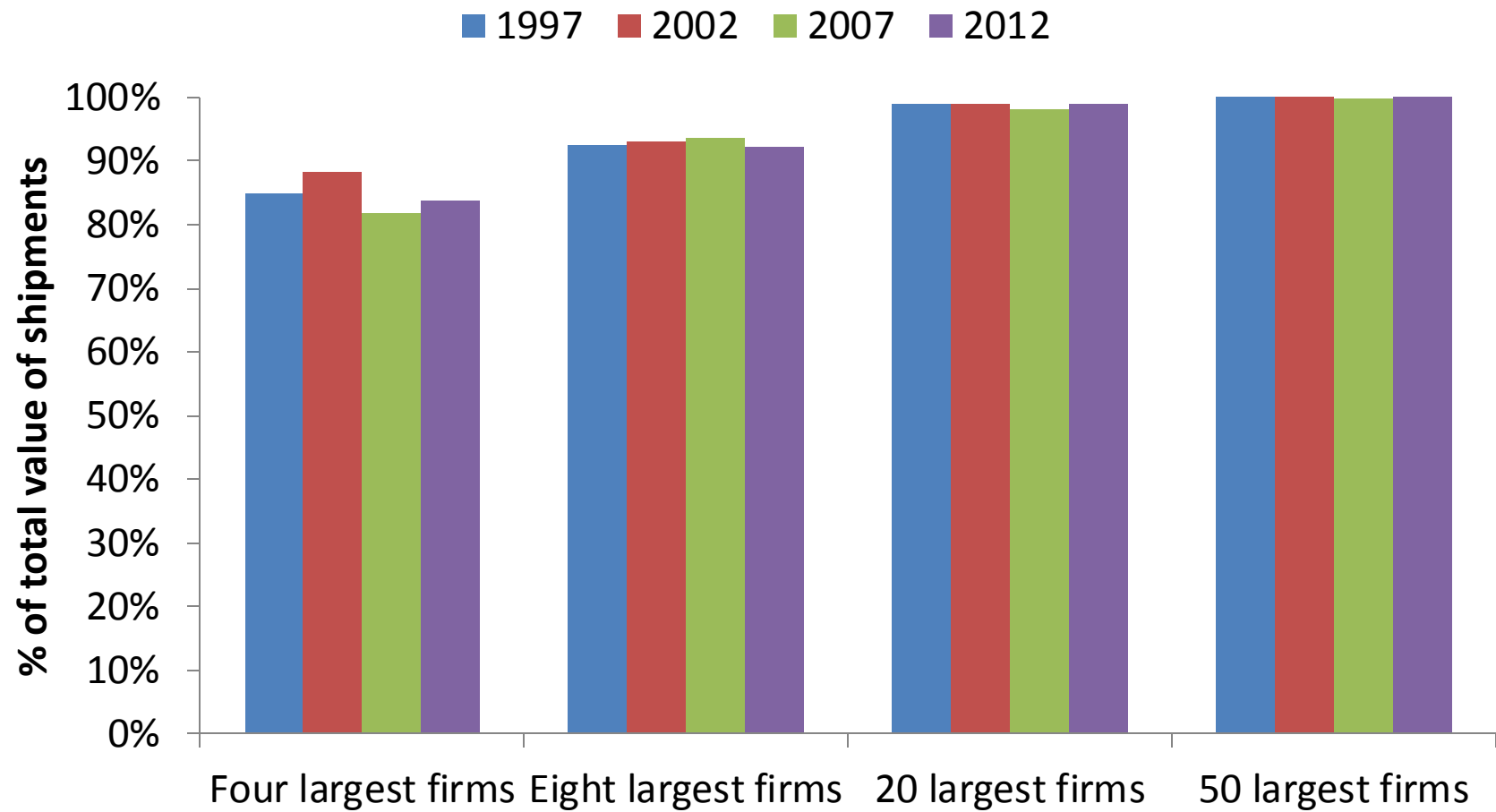


# Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing (NAICS Code 334511) Firms by Number of Employees

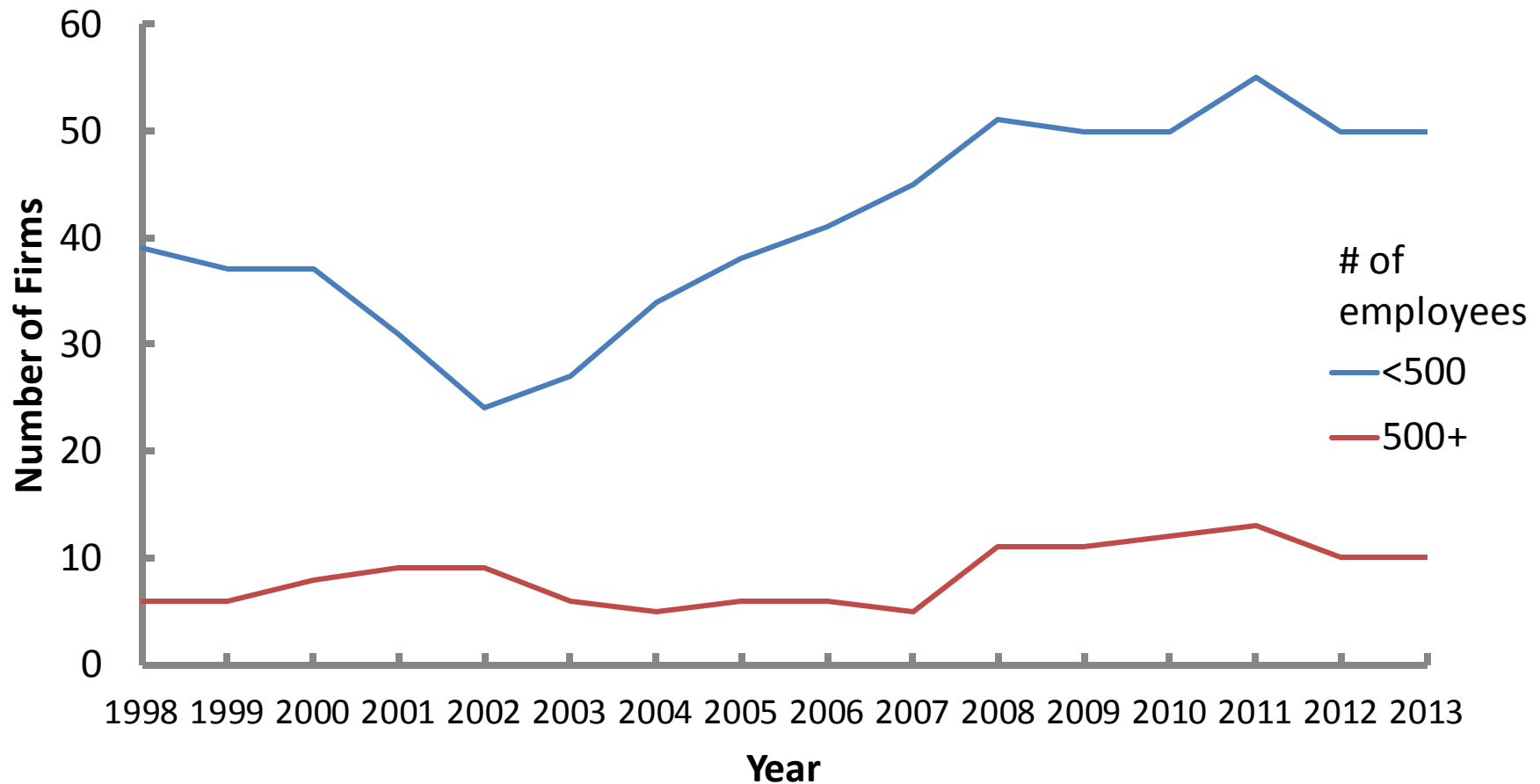


SBA size standard = 1,250 employees

# Concentration Indexes for Military Armored Vehicle, Tank, and Tank Component Manufacturing (NAICS Code 336992)



# Military Armored Vehicle, Tank, and Tank Component Manufacturing (NAICS Code 336992) Firms by Number of Employees



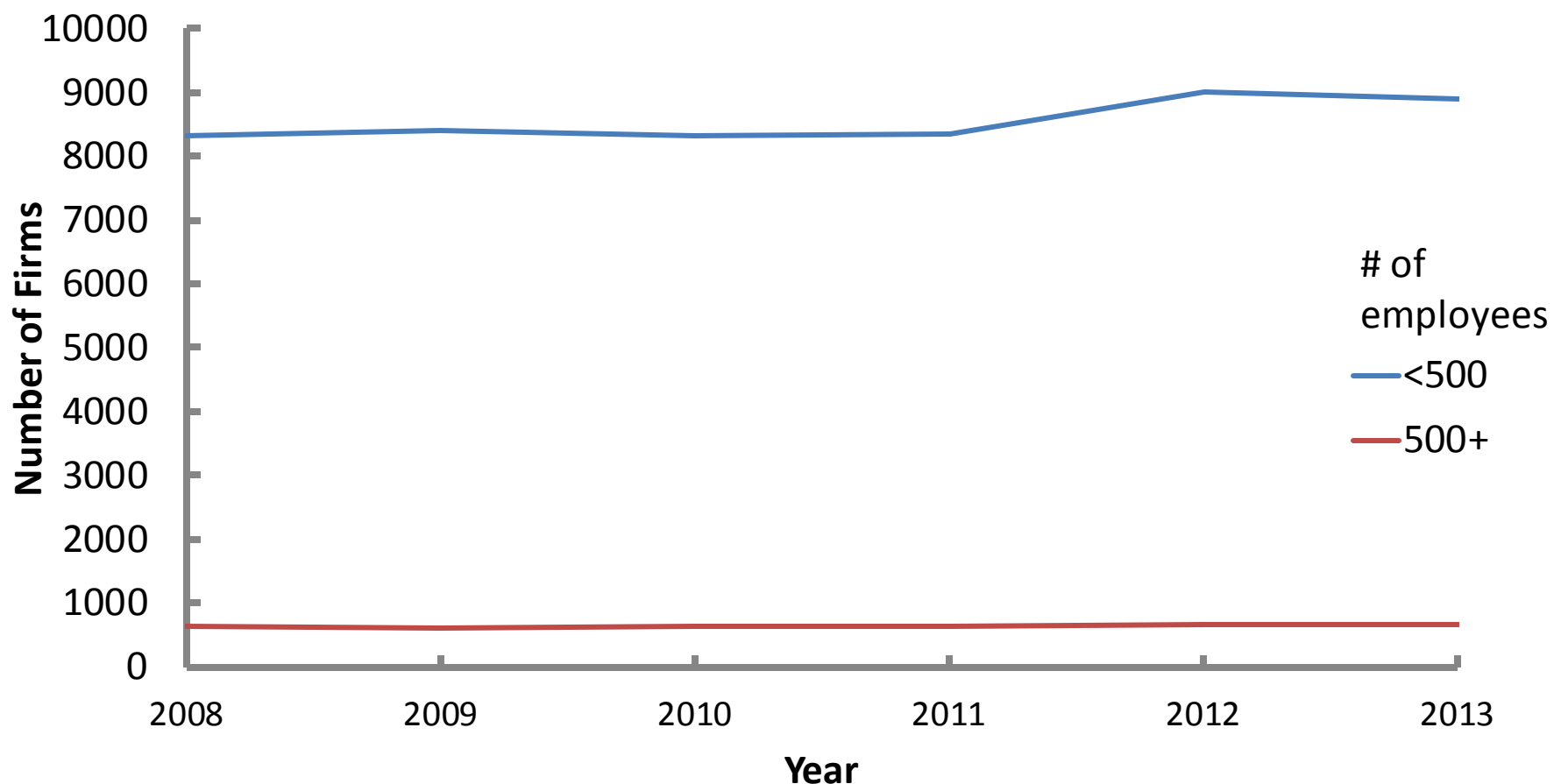
SBA size standard = 1,500 employees



# Concentration Indexes for Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology) (NAICS Code 541712)



# Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology) (NAICS Code 541712) Firms by Number of Employees

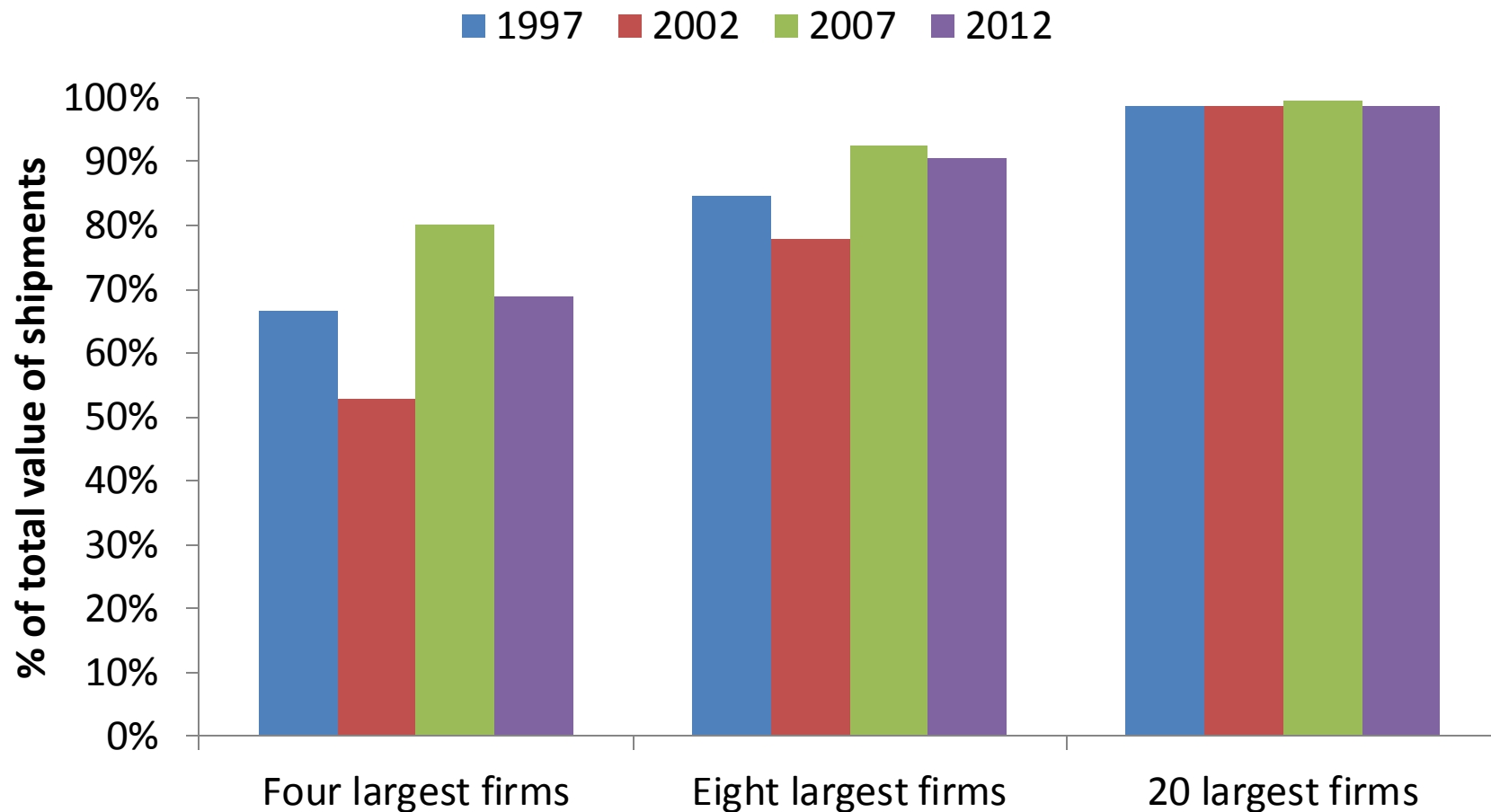


SBA size standard = 1,000 employees except Aircraft Engine and Engine Parts = 1,500 employees and Other Aircraft Parts and Auxiliary Equipment and Guided Missiles and Space Vehicles, Their Propulsion Units and Propulsion Parts = 1,250 employees

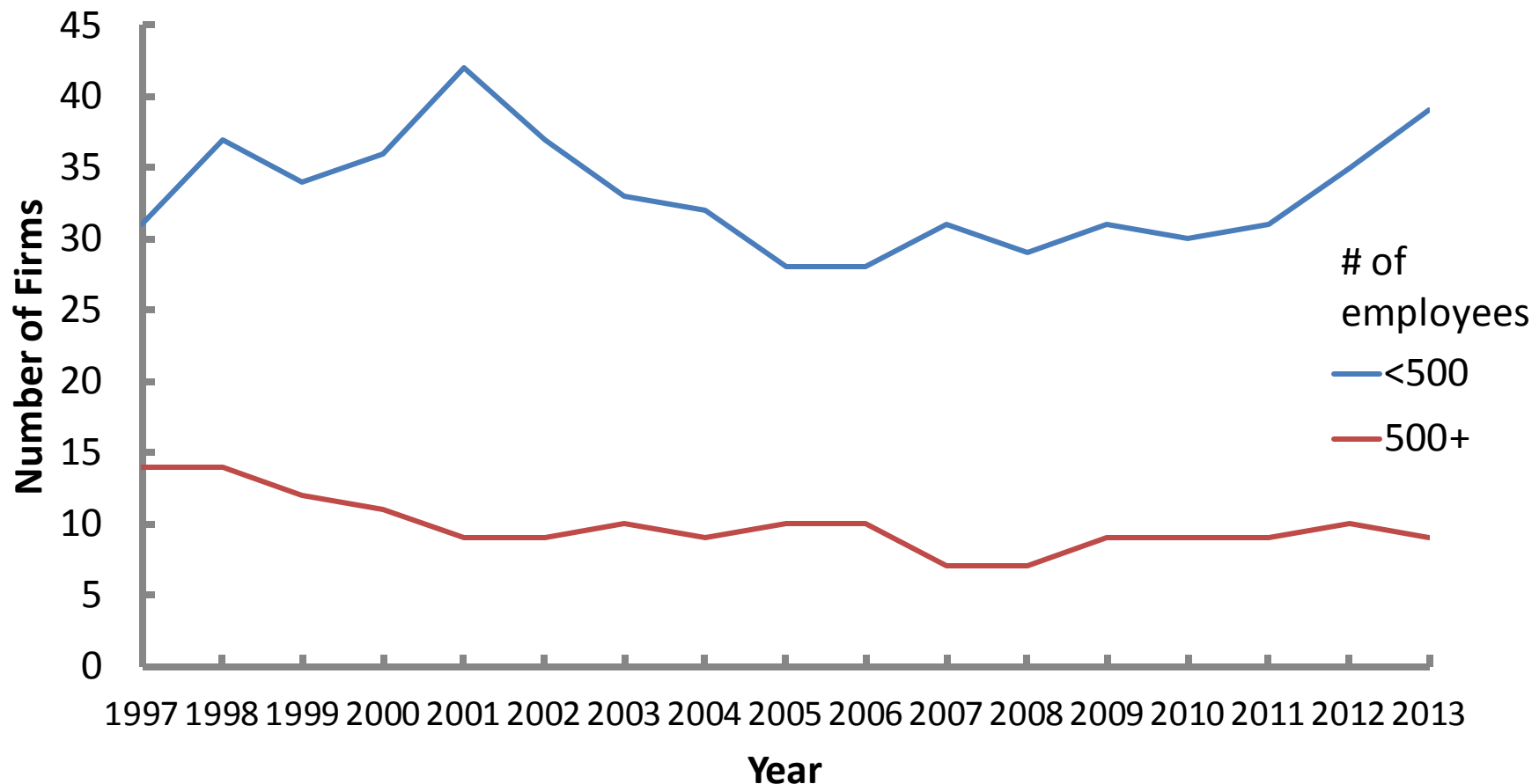
Source: Statistics of U.S. Businesses. Current definition of industry implemented in 2007.

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# Concentration Indexes for Ammunition (except Small Arms) Manufacturing (NAICS Code 332993)



# Ammunition (except Small Arms) Manufacturing (NAICS Code 332993) Firms by Number of Employees

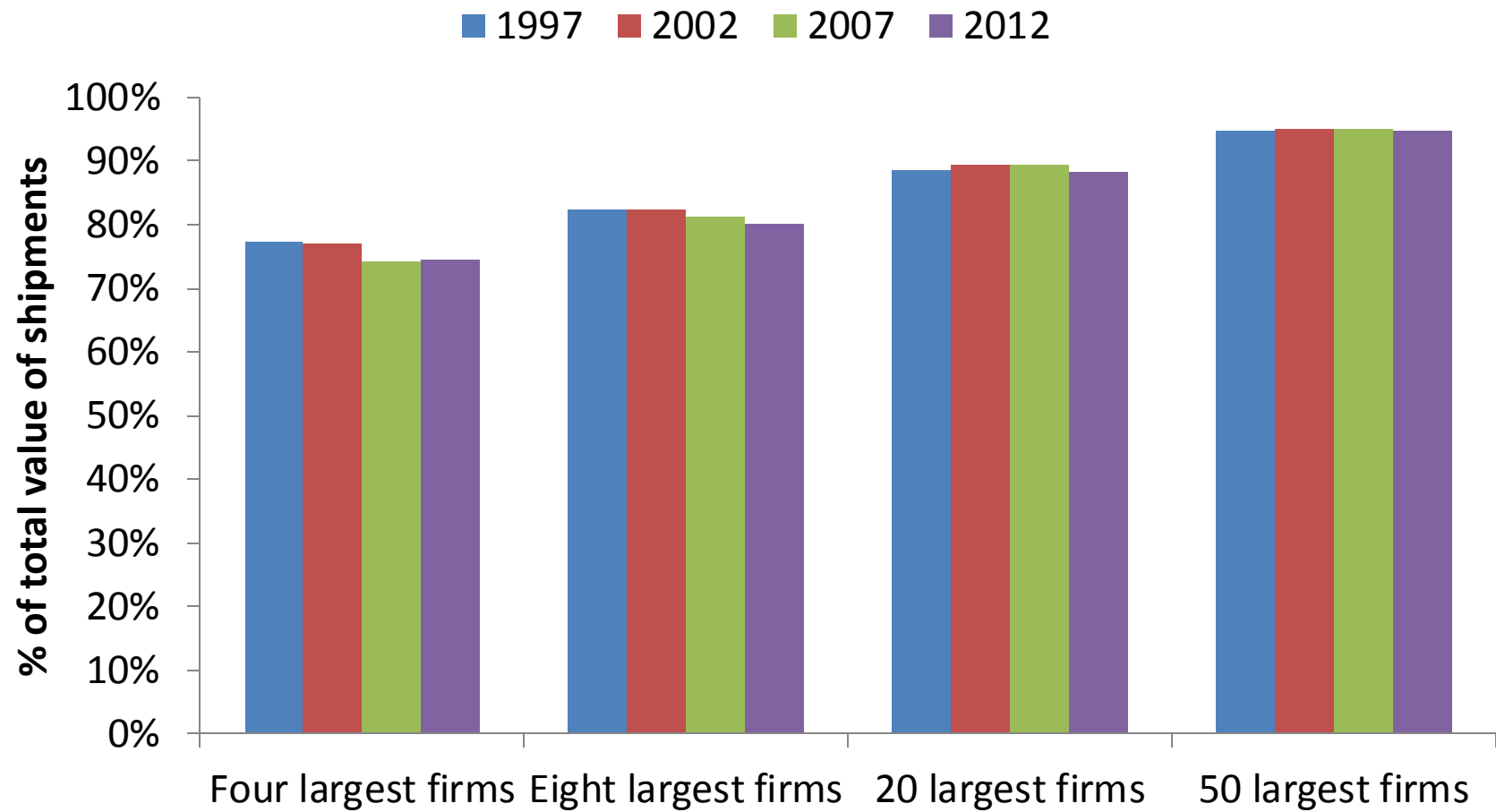


SBA size standard = 1,500 employees

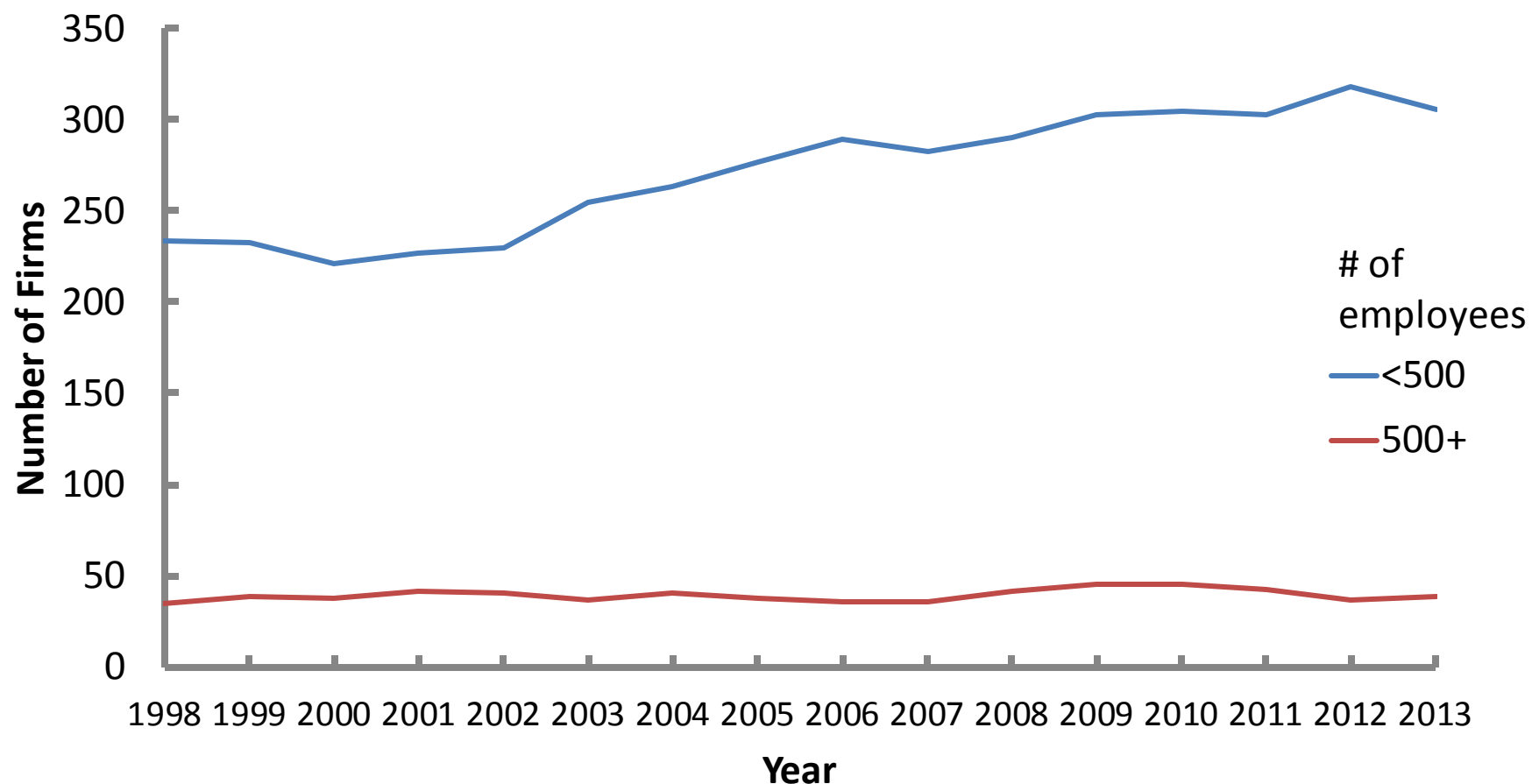
Source: Statistics of U.S. Businesses. NAICS code 332993 is in concordance with SIC code 3483.

Approved for public release; distribution is unlimited.

# Concentration Indexes for Aircraft Engine and Engine Parts Manufacturing (NAICS Code 336412)



# Aircraft Engine and Engine Parts Manufacturing (NAICS Code 336412) Firms by Number of Employees

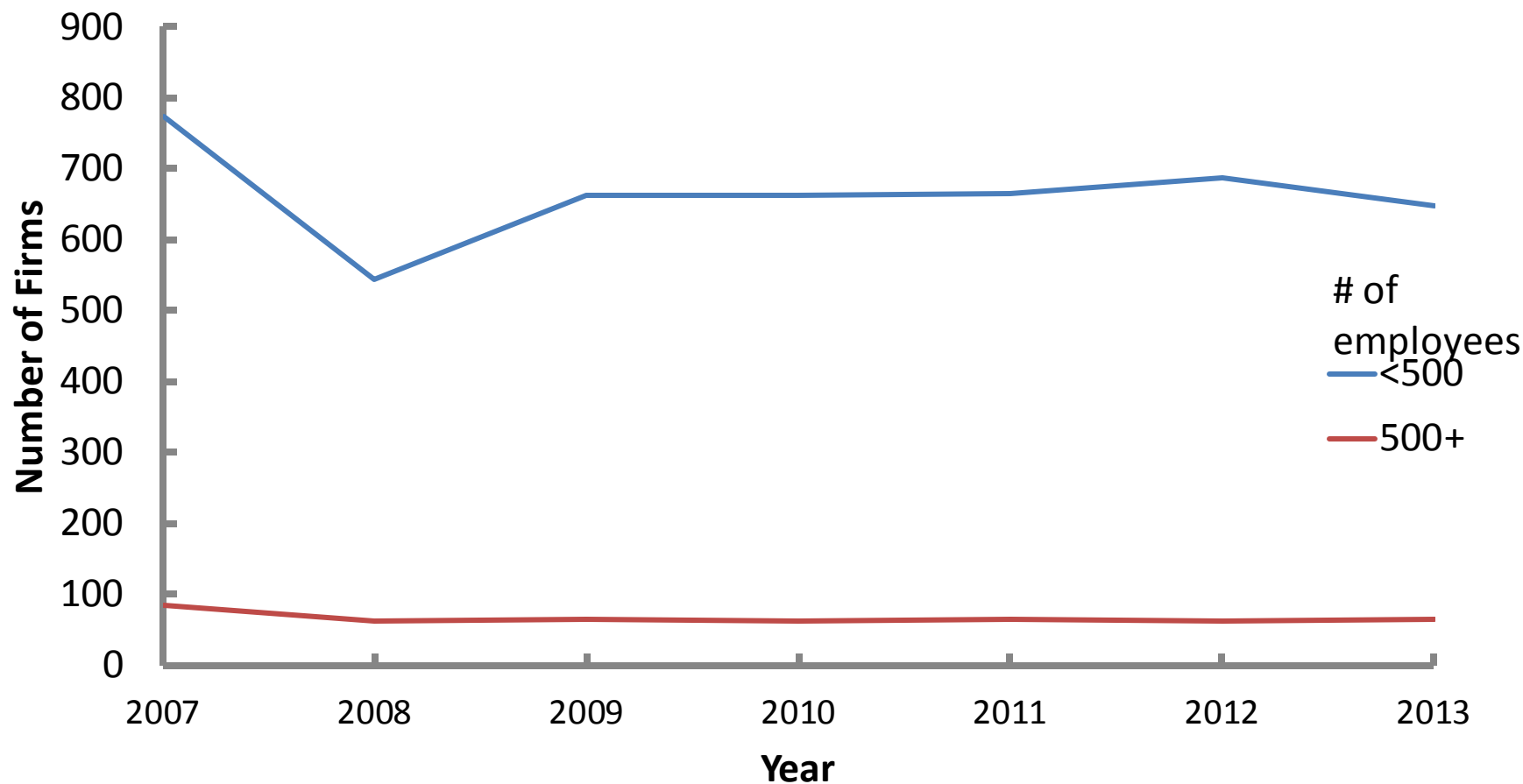


SBA size standard = 1,500 employees

# Concentration Indexes for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing (NAICS Code 334220)



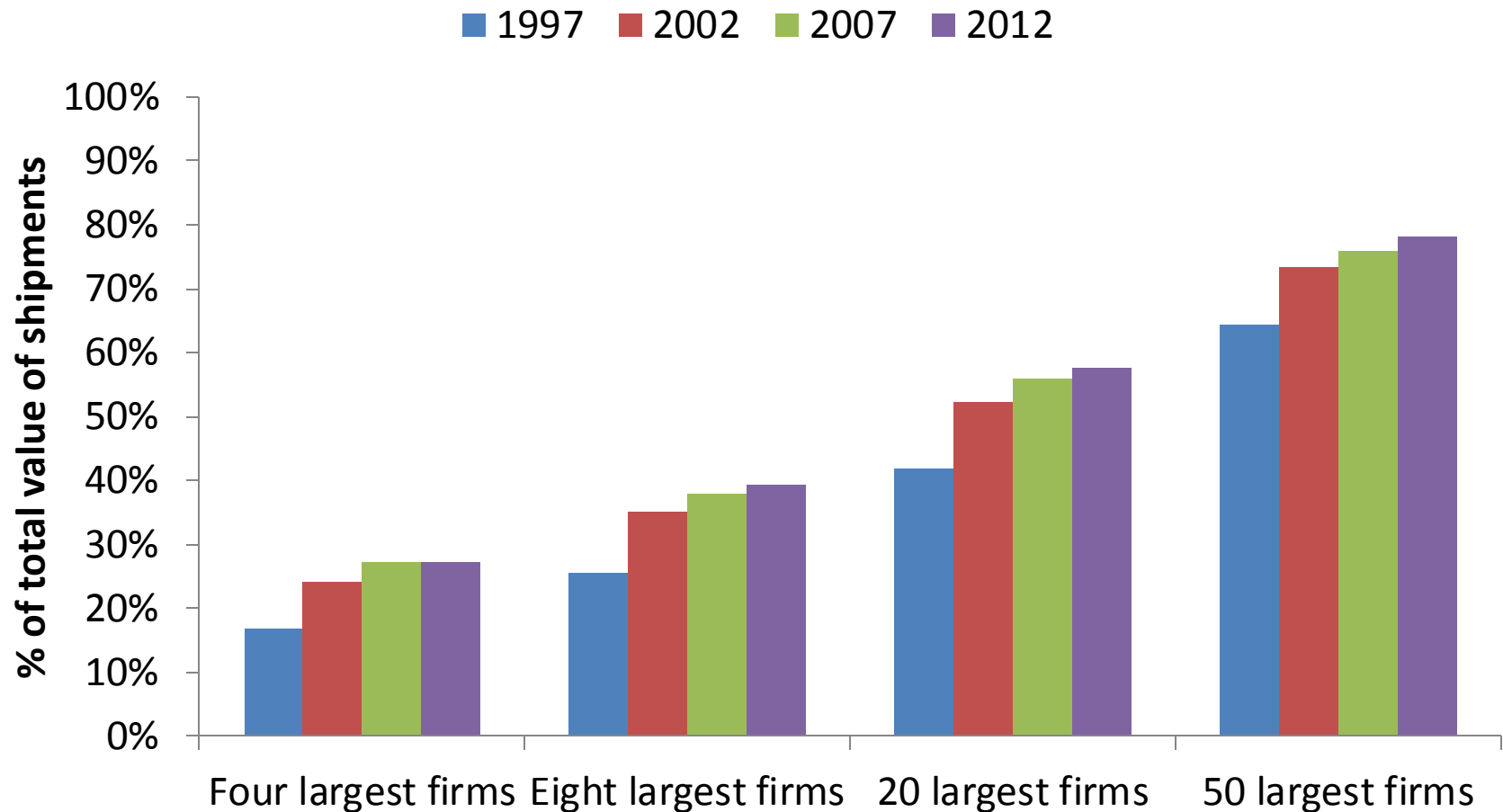
# Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing (NAICS Code 334220) Firms by Number of Employees



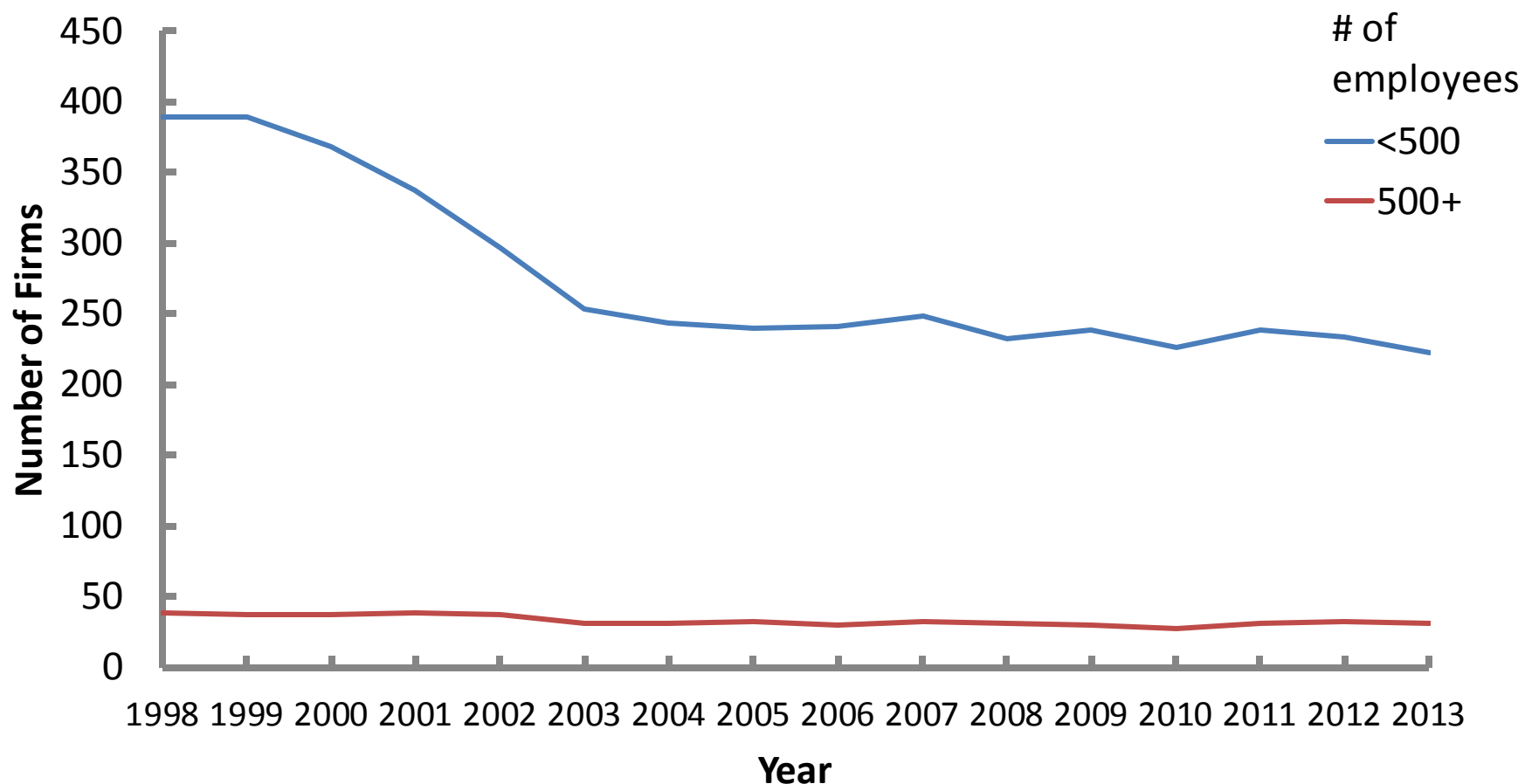
SBA size standard = 1,250 employees



# Concentration Indexes for Power Boiler and Heat Exchanger Manufacturing (NAICS Code 332410)



# Power Boiler and Heat Exchanger Manufacturing (NAICS Code 332410) Firms by Number of Employees



SBA size standard = 750 employees

Source: Statistics of U.S. Businesses.

# Herfindahl-Hirshman Index (HHI)

- Sum of the squared market shares of all the firms in the industry
- The Federal Trade Commission (FTC) used the following cutoffs for the HHI\* in 1997
  - Less than 1,000: unconcentrated
  - 1,000 to 1,800: moderately concentrated
  - Above 1,800: highly concentrated

\*FTC Horizontal Merger Guidelines, revised April 8, 1997, pp. 14-15.

# Registered Firms by Industry and Size

